(1)

EOSR NO. 1608

AD-A207 236

FINAL REPORT MM&T FOR LINEAR RESONANT COOLER VOLUME II OF II

Dr. R. Narayan and J. Silvestro
Magnavox Government and Industrial Electronics Company
46 Industrial Avenue
Mahwah, N.J. 07430

2 February 1989

Final Report For October 1984 to September 1986

Prepared For
U.S. Army Communications-Electronics Command (CECOM)
Fort Monmouth, N.J. 07703-5000

U.S. Army Center For Night Vision & Electro-Optics
Fort Belvoir, Va. 22060

EOSR NO. 1608

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Fort Belvoir, Va. 22060

VOLUME II CONSISTS OF THE FOLLOWING APPENDICES

APPENDIX A - SM-D-5005843 0.25 WATT LINEAR RESONANT COOLER ASSEMBLY DRAWING AND PARTS LIST

APPENDIX B - TABLE NO. 1 - ACCEPTANCE/PERFORMANCE TEST
2 - ACOUSTIC NOISE TEST DATA AND PLOTS
3 - BASELINE AND POST TEMPERATURE SHOCK
4 - LOW TEMPERATURE AND POST LOW TEMPERATURES
5 - HIGH TEMPERATURE AND POST HIGH TEMPERATURES
6 - POST MECHANICAL SHOCK
7 - POST VIBRATION
8 - EMI
9 - RELIABILITY (SN 011)
10 - RELIABILITY (SN 015)
11 - RELIABILITY (SN 016)

APPENDIX C - FAILURE REPORTS

APPENDIX A

SM-D-5005843

0.25 WATT LINEAR RESONANT

COOLER ASSEMBLY DRAWING

AND PARTS LIST

PARTS LIST	U.S. ARMY ELECTRONICS RESEARCH AND DEVELOPMENT COMMAND NIGHT VISION AND ELECTRO-OPTICS LABORATORY FORT BELVOIR VIRGINIA 22060	FSCM NO. 54490	PL SM5005843	REV LTR / DATE B 3 SEPT 86
LIST TITLE 0.25 WATT LINEAR RESONANT COOLER ASSEMBLY	CONTRACT NO. DAAK20-84-C-0440	AUTHENTICATION P. Bruno	REV AUTH 24407-0178	SHT 1 OF 2

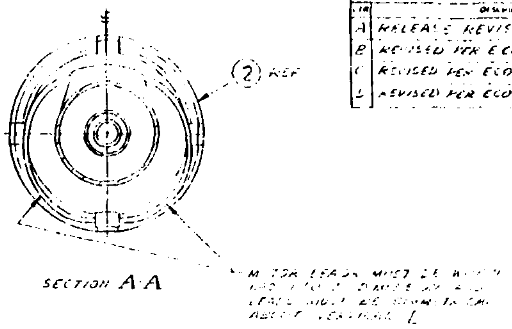
ITEM OR FIND NO.	QTY REQ	FSCM NO.	DRAWING OR SPECIFICATION NO.	PART OR IDENTIFICATION NUMBER	NOMENCLATURE OR DESCRIPTION	PL	NOTES OR REMARKS
1	1	54490	SM-C-5005860	SM-C-5005860	HOUSING TIG WELD ASSEMBLY	X	
2	1	54490	SM-D-5005847	SM-D-5005847	COIL & VIBRATION ABSORBER ASSEMBLY	X	
3	1	54490	SM-D-5005849	SM-D-5005849	ELECTRONICS ASSEMBLY	X	
4	1	54490	SM-C-5005859	SM-C-5005859	CAP ASSEMBLY	X	
5	1	54490	SM-C-5005870	SM-C-5005870	SET SCREW		
6	1	54490	SM-C-5005873	SM-C-5005873-1	SHIM		
7	1	54490	SM-C-5005873	SM-C-5005873-2	SHIM		
8	1	54490	SM-C-5005873	SM-C-5005873-3	SHIM		
9	1	54490	SM-C-5005873	SM-C-5005873-4	SHIM		
10	1	54490	SM-C-5005979	SM-C-5005979-1	SPACER		15
11	1	54490	SM-C-5005979	SM-C-5005979-2	SPACER		15
12	1	54490	SM-C-5005979	SM-C-5005979-3	SPACER		15
13	1	54490	SM-C-5005938	SM-C-5005938	END CAP ASSEMBLY	X	
14	1	54490	SM-C-5005939	SM-C-5005939	CYLINDER ASSEMBLY	X	
15	1	54490	SM-C-5005937	SM-C-5005937	DISPLACER ASSEMBLY	X	
16	1	54490	SM-C-5005953	SM-C-5005953	WASHER		
17	1	54490	SM-C-5005956	SM-C-5005956	CLAMP		11
18	1	54490	SM-D-5005958	SM-D-5005958	PROTECTOR SLEEVE		11
19	1	54490	SM-C-5005955	SM-C-5005955	RING, GUIDE		
20	1	54490	SM-C-5005967	SM-C-5005967	CAP, DUST		11
21	1	54490	SM-C-5005951	SM-C-5005951	SLEEVE		
22	1	54490	SM-C-5005959	SM-C-5005959	"O" RING		
23	5	54490	SM-C-5005954	SM-C-5005954-1	SPACER		9, (.001/.003)
24	5	54490	SM-C-5005954	SM-C-5005954-2	SPACER		9, (.004/.006)
25	5	54490	SM-C-5005954	SM-C-5005954-3	SPACER		9, (.009/.011)
26	5	54490	SM-C-5005954	SM-C-5005954-4	SPACER		9, (.014/.016)
27	AR	54490	SM-A-5005960	SM-A-5005960	WIRE, INDIUM		(Ø.034)

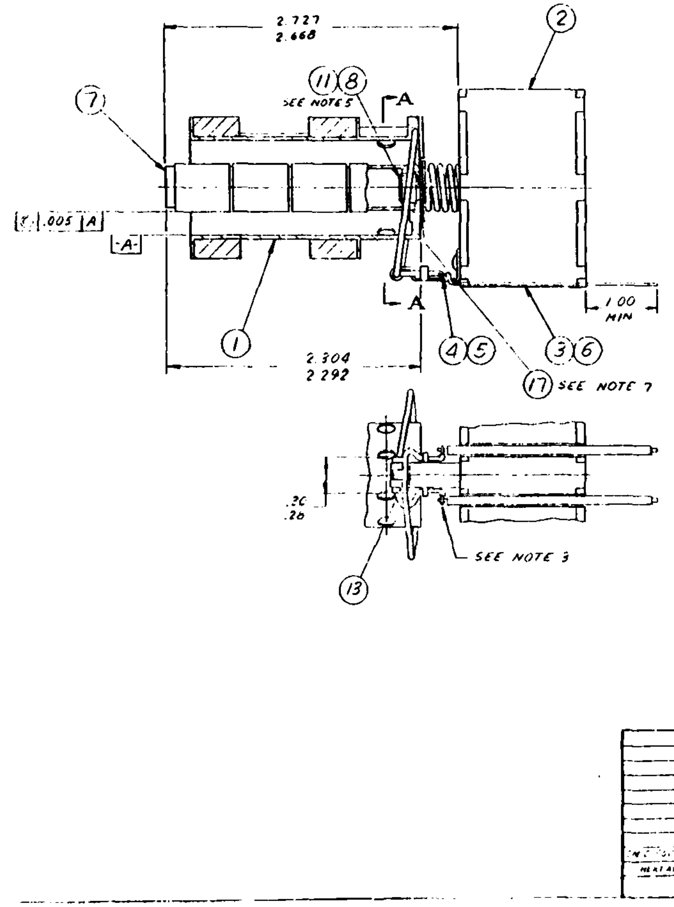
PARTS LIST	U.S. ARMY ELECTRONICS RESEARCH AND DEVELOPMENT COMMAND NIGHT VISION AND ELECTRO-OPTICS LABORATORY FORT BELVOIR VIRGINIA 22060	FSCM NO. 54490	PL SM5005843	REV LTR / DATE B 3 SEPT 86

LIST TITLE	CONTRACT NO.	AUTHENTICATION	REV AUTH	
0.25 WATT LINEAR RESONANT COOLER ASSEMBLY	DAAK20-84-C-0440	P. Sousa	24407-0178	SHT 2 OF 2

ITEM OR FIND NO	QTY REQ	FSCM NO	DRAWING OR SPECIFICATION NO.	PART OR IDENTIFICATION NUMBER	NOMENCLATURE OR DESCRIPTION	PL	NOTES OR REMARKS
28	15"	54490	SM-C-5005982	SM-C-5005982	CABLE		7
29	1	54490	SM-C-5005894	SM-C-5005894	TRANSFER TUBE		2
30	1	54490	SM-C-5005895	SM-C-5005895	NAMEPLATE		13
31	AR	54490	SM-A-5005896	SM-A-5005896	BRAZE FILLER METAL		2
32	REF	54490	SM-A-5005911	SM-A-5005911	BRAZING SPECIFICATION (NIORO)		
33	REF	54490	SM-A-5005912	SM-A-5005912	GENERAL CLEANING SPECIFICATIONS FOR CRYOCOOLERS		1
34	AR	81348	QQ-S-571	QQ-S-571 TYPE RMA	SOLDER, TIN ALLOY; TIN-LEAD ALLOY AND LEAD ALLOY		4, Sn60/Pb 40 ROSIN CORE SOLDER .031 DIA.
35	AR	54490	SM-A-5005865	SM-A-5005865	EPOXY, STRUCTURAL		8
36	REF	81349	MIL-W-8611	MIL-W-8611	WELDING, METAL ARC AND GAS, STEELS AND CORROSION AND HEAT RESISTANT ALLOYS PROCESS FOR		6
37	REF	96906	MIL-STD-454	MIL-STD-454 REQMT. 5	STANDARD GEN. REQUIREMENTS FOR ELECTRONIC EQUIPMENT		4
38	REF	96906	MIL-STD-130	MIL-STD-130	IDENTIFICATION MARKING FOR U.S. MILITARY PROPERTY		17
39	4	96906	MS16995-11	MS16995-11	SCREW SOCKET HEAD		11, 4-40 X 1/2 LG
40	4	80205	NAS-1352C04-10	NAS-1352C04-10	SCREW SOCKET HEAD		10, 4-40 X 5/8 LG
41	AR	54490	SM-A-5005999	SM-A-5005999	ADHESIVE, EPOXY-STRUCTURAL		
42	1	54490	SM-C-5006016	SM-C-5006016	SLEEVING, INSULATION		
43	2	54490	SM-C-5005881	SM-C-5005881-3	INSULATOR		
44	1	54490	SM-C-5005899	SM-C-5005899	LEAD SHOT NO. 5		
45	1	54490	SM-C-5005874	SM-C-5005874-1	SPACER		18
46	AR	81349	MIL-S-46163	MIL S 46163, TYPE II, GRADE M	ADHESIVE, SEALANT		19

LTR	DESCRIPTION	DATE	APPROVED
A	RELEASE REVISION		
B	REVISED PER ECO 24407	23 JUL 86	
C	REVISED PER ECO 24407 - 1025	SEP 86	
D	REVISED PER ECO 24407 - 1208		





NOTES:

1. CLEAN AND HANDLE PARTS PER SM-A 500592
2. EPOXY LEADS FROM ITEM 1 INTO SLOTS ON BOTTOM OF ITEM 2 USING ITEM 5
3. SOLDER LEADS FROM ITEM 1 TO ITEM 3 AS SHOWN, INSULATE LEAD CONNECTIONS WITH ITEM 4. WORKMANSHIP SHALL BE IN ACCORDANCE WITH MIL-STD-454 REQ.5
4. IDENTIFY THIS PART (ENVELOPE, BAG OR TAG) WITH 54490 - SM-D-500584? PER MIL-STD-130
5. APPLY ITEM 11 TO ITEM 8 AND TORQUE TO 8-9 IN. LBS.
6.
7. ADD ITEM 17 AS REQUIRED TO MEET 2.668 - 2.727 DIMENSION

NIGHT VISION & ELECTRO-OPTICS LABORATORY

COIL VIBRATION ... ER ASSY

D | 54490 | SM-D 500584?

APPENDIX B

TEST DATA

APPENDIX B

Tab No.	
1	Acceptance/Performance Test
2	Acoustic Noise Test Data and Plots
3	Baseline and Post Temperature Shock
4	Low Temperature and Post Low Temperatures
5	High Temperature and Post High Temperatures
6	Post Mechanical Shock
7	Post Vibration
8	EMI
9	Reliability (SN 011)
10	Reliability (SN 015)
11	Reliability (SN 016)

Magnavox

ELECTRO-OPTICAL SYSTEMS

Contract No. DAAK20-84-C-0440 PERFORMANCE TEST

Project No. 24407

DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC SERIAL NO. 010

DRAWING NO. SM-D-5005842

TEST PLAN PARA	PARAMETER	MEASURED	UNITS	LIMITS MIN	LIMITS MAX
3.10	Calibration Check	COMPLY	-	Comply	
4.1.1	Inspection to SM-D-5005842	COMPLY	-	Comply	
4.1.2	Weight	2.3	Lbs	-	2.5
4.1.3.1	Pressurization	330	PSIG	Info	Only
4.1.3.2	Leakage Rate	1.2×10^{-8}	STP CC/SEC	-	2.7×10^{-7}
4.2.2	Test at 23°C Horiz; Turn-on Current	N/A	Amps	Info	
4.2.2	Cooldown Time to 100°K	45	Minutes	-	7.5
4.2.2	Cooldown Time to 80°K	5.3	Minutes	-	10
4.2.2	Minimum Temp	39.5	°K	Info	80
4.2.2.1	Stabl. Temp. with 0.35 Watt Heat Load	65.0	°K		80
4.2.2.2	Temp. after 1/2 Hour Operation	65.8	°K	-	80
4.2.2.3	Cold Finger warm end temp	41.0	°C	Info	Only
4.2.2.4	Input Volt 17 VDC Current 1.42 ADC Power	24.14	Watts	-	30
4.2.2.5	Stabl. Temp with 0.35 Watt Heat Load	65.9	°K		80
4.2.2.5	Cold Finger Warm End Temp	41.0	°C	Info	Only
4.2.2.5	Input Volts 32 VDC Current .84 ADC Power	26.88	Watts	-	30
4.2.3	Test at -40°C Horiz; Turn-on Current	N/A	Amps	Info	
4.2.3.1	Cooldown Time to 100°K	3.9	Minutes	-	7.5
4.2.3.1	Cooldown Time to 80°K	4.6	Minutes	-	10
4.2.3.2	Stabl. Temp with 0.2 Watt Heat Load	45.1	°K	-	80
4.2.3.2	Temp after 1/2 Hour	44.9	°K	-	80
4.2.3.3	Cold Finger Warm End Temp	-28	°C	Info	Only
4.2.3.4	Input Volts 17 VDC Current 1.34 ADC Stablized Power	22.78	Watts	-	30
4.2.3.5	Temp with 0.2 Watt Head Load	45.1	°K	-	80
4.2.3.5	Cold Finger Warm End Temp	-27	°C	Info	Only
4.2.3.5	Input Volts 32 VDC Current .80 ADC Power	25.6	Watts	-	30
4.2.4	Test at 71°C Horiz; Turn-on Current	N/A	Amps	Info	
4.2.4.1	Cooldown Time to 100°K	5.7	Minutes	-	7.5
4.2.4.1	Cooldown Time to 80°K	6.8	Minutes	-	10
4.2.4.1	Stabl. Temp. with 0.2 Watt Heat Load	65.1	°K	-	80
4.2.4.1	Temp after 1/2 hour	66.3	°K	-	80
4.2.4.2	Cold Finger Warm End Temp	87	°C	Info	Only
4.2.4.3	Input Volts 17 VDC Current 1.66 ADC Power	28.22	Watts	-	35
4.2.4.4	Stabl. Temp with 0.2 Watt Head Load	65.6	°K	-	80
4.2.4.4	Cold Finger Warm End Temp	87	°C	Info	Only
4.2.4.4	Input Volts 32 VDC Current ADC .96 Power	30.72	Watts	-	35

Performed By: P. HARTMANN B-2 Date: 10-29-86

Witnessed By: 31 OCT 1986 O. A. Magnavox

Witnessed By: DW-22 O. A. Customer

Magnavox
ELECTRO-OPTICAL SYSTEMS
P.O. BOX 618, 40 INDUSTRIAL AVENUE, MAHWAH, N.J. 07430-0618
TEL: 201-529-1700 TWX: 710-988-9672

Contract: DAAK20-84-C-0440 PERFORMANCE TEST

Project: 24407 DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC SERIAL NO. 010
DRAWING NO. SM-D-5005842

TEST PLAN PARA	PARAMETER	MEASURED	UNITS	LIMITS MIN	LIMITS MAX
4.2.5	Test at 23°C Vertical; Turn-on Current	N/A	Amps	Info	
4.2.5.1	Cooldown Time to 100°K	4.7	Minutes	-	7.5
4.2.5.1	Cooldown Time to 80°K	5.4	Minutes	-	10
4.2.5.1	Minimum Temp	38.9	°K		80
4.2.5.2	Stabl. Temp with 0.35 Watt Heat Load	66.1	°K	-	80
4.2.5.3	Temp After 1/2 Hour With Heat Load	66.9	°K	Info	80
4.2.5.4	Cold Finger Warm End Temp	34	°C	Info	Only
4.2.5.5	Input Volts 17 VDC Current 1.37 ADC Power	23.29	Watts	-	30
4.2.5.6	Stabl. Temp. with 0.35 Watt Heat Load	65.5	°K		80
4.2.5.6	Cold Finger Warm End Temp	35	°C	Info	Only
4.2.5.6	Input Volt 32 VDC Current .82 ADC Power	26.24	Watts	-	30
4.2.6	Leakage Rate	2.8×10^{-7}	STP CC/SEC	-	2.7×10^{-7}

PERFORMED BY P HARTMANN DATE 10-31-86

WITNESSED BY [signature] Q.A. MAGNAVOX

WITNESSED BY [signature] Q.A. CUSTOMER

31 OCT 1986

Magnavox

ELECTRO-OPTICAL SYSTEMS

P.O. BOX 630, 46 INDUSTRIAL AVENUE, JOHNSON, N.J. 07438-0630

TEL: 201-579-1700 TWX: 710-988-1672

PERFORMANCE TEST

VIBRATION OUTPUT TEST DATA

1/4 WATT LINEAR RESONANT CRYOGENIC COOLER

MM & T PROGRAM

DRAWING NO.: SM-D-5005842 SERIAL NO.: 010

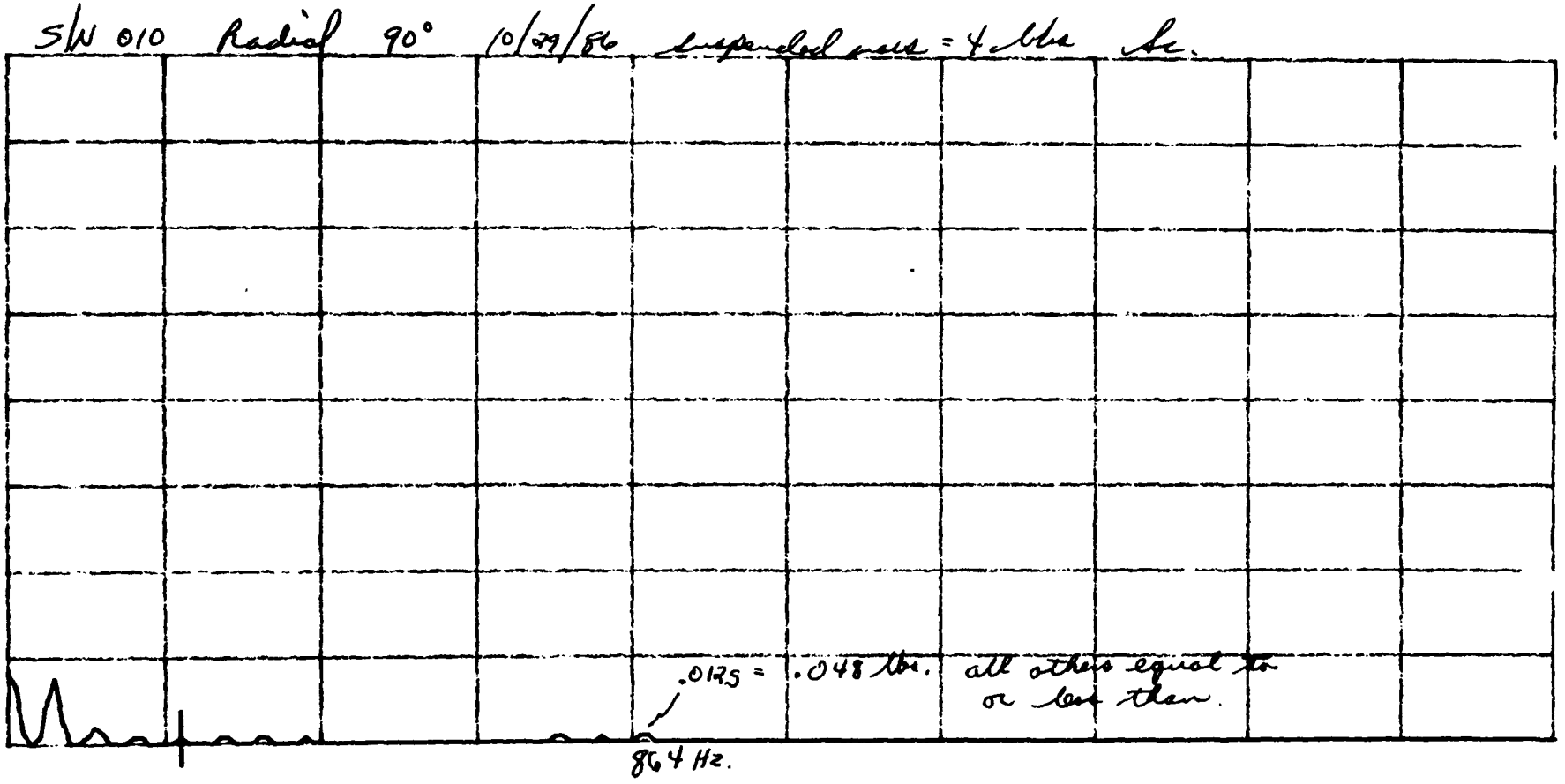
CONTRACT : DAAK20-84-C-0440 PROJECT : 24407

Test Plan Para	Frequency	Maximum Force Along Compressor Axis, ± lbs	Measure Force Along Compressor Axis, lbs.	Maximum Force In Any Compressor Radial Axis, ± lbs	Measured Force In Any compressor Radial 0° Axis, lbs.	90°
4.3.9	Fundamental (54 Hz)	1.0	.529	1.5	.736	1.0
	1st Harmonic (108 Hz)	2.5	2.49	0.22	.024	.22
	2nd Harmonic (162 Hz)	1.4	.776	0.13	.012	.060
	3rd Harmonic (216 Hz)	0.30	.288	0.13	.008	.14
	Next 37 Harmonics	0.10	<.1	0.10	<.1	<.1

PERFORMED BY: A Caniglia DATE: 10/29/86

WITNESSED BY: [signature] DCAS-QAC S310A CUSTOMER Q.A. 29 OCT 1986

[signature] MAGNAVOX Q.A.



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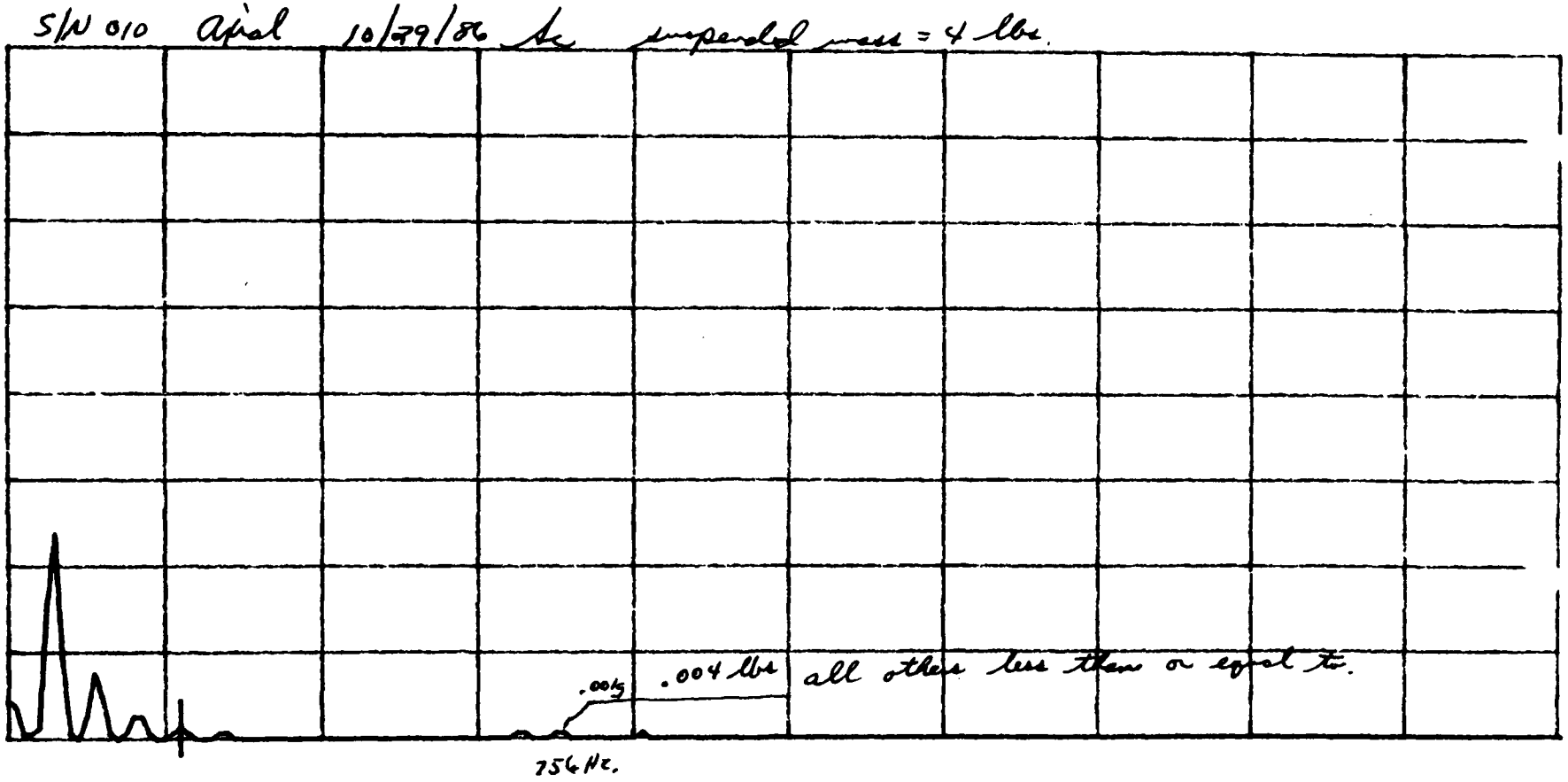
SPAN: 50.00HZ -2.0500KHZ SN: 1.0+01V FS: 2.0+00R 2.5-01R/



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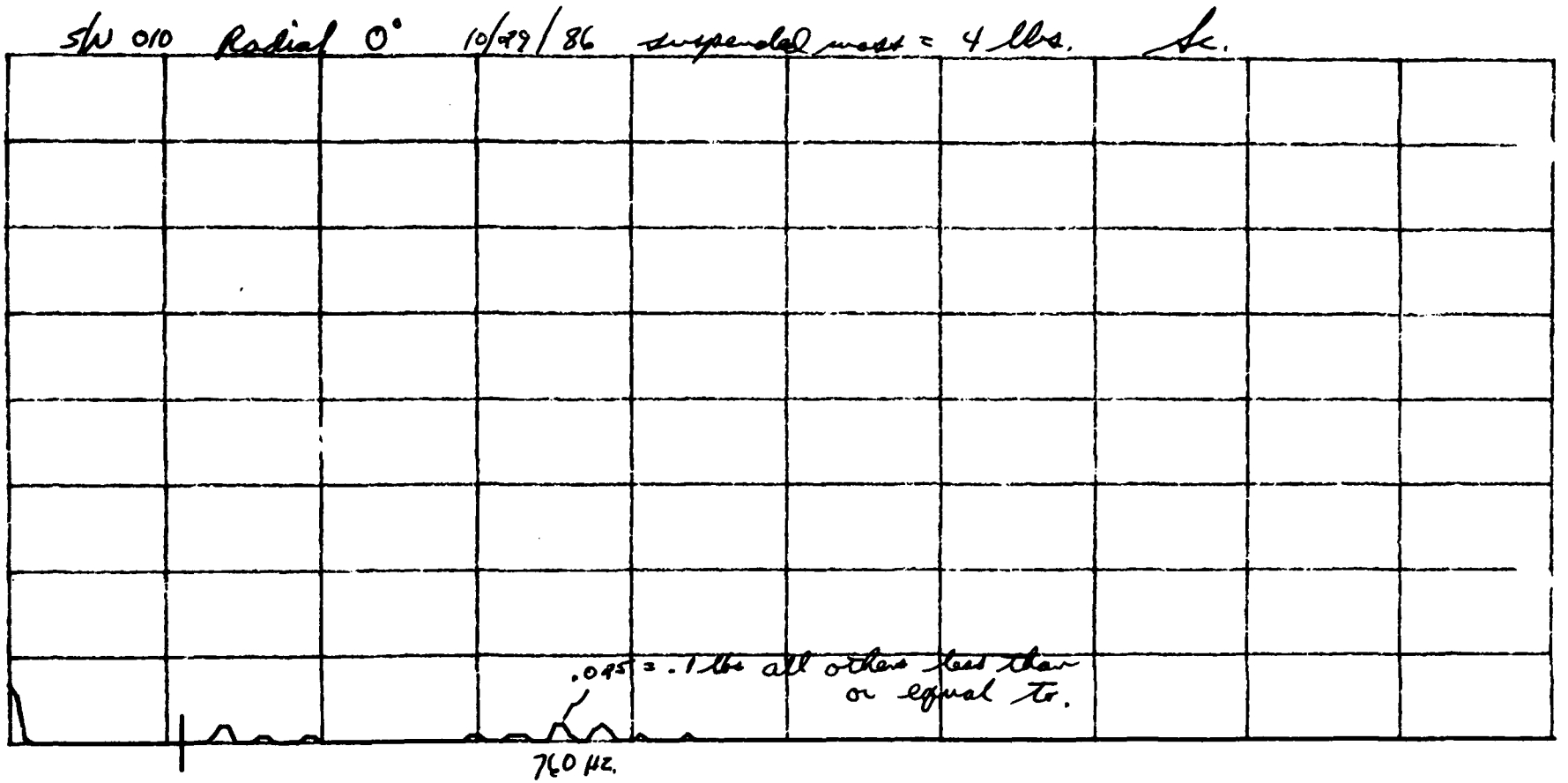

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SPAN: 50.00HZ -2.0500KHZ SN: 1.0+01V FS: 2.0+00R 2.5-01R/

PERFORMANCE TEST

DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC SERIAL NO. 011
DRAWING NO. SM-D-5005863/SM-D-5005842

TEST PLAN PARA	PARAMETER	MEASURED	UNITS	LIMITS MIN	LIMITS MAX
3.10	Calibration Check	[illegible]	-	Comply	
4.1.1	Inspection to SM-D-5005863/5005842	[illegible]	-	Comply	
4.1.2	Weight	2.35	Lbs	-	2.5
4.1.3.1	Pressurization	350	PSIG	Info	Only
4.1.3.2	Leakage Rate	4×10^{-9}	STP CC/SEC	-	2.7×10^{-7}
4.2.2	Test at 23°C Horiz; Turn-on Current	1.5 to 1.05	Amps	Info	
4.2.2	Cooldown Time to 100°K	5.1	Minutes	-	7.5
4.2.2	Cooldown Time to 80°K	5.9	Minutes	-	10
4.2.2	Minimum Temp	50.7	°K	Info	80
4.2.2.1	Stabl. Temp. with 0.35 Watt Heat Load	69.1	°K		80
4.2.2.2	Temp. after 1/2 Hour Operation	69.3	°K	-	80
4.2.2.3	Cold Finger warm end temp	31	°C	Info	Only
4.2.2.4	Input Volt 17 VDC Current 1.35 ADC F.B. OK Power 22.95	22.9	Watts	-	30
4.2.2.5	Stabl. Temp with 0.35 Watt Heat Load	70.3	°K		80
4.2.2.5	Cold Finger Warm End Temp	31	°C	Info	Only
4.2.2.5	Input Volts 32 VDC Current .74 ADC Power 23.68	23.7	Watts	-	30
4.2.3	Test at -40°C Horiz; Turn-on Current	1.2	Amps	Info	
4.2.3.1	Cooldown Time to 100°K	6.1	Minutes	-	7.5
4.2.3.1	Cooldown Time to 80°K	6.7	Minutes	-	10
4.2.3.2	Stabl. Temp with 0.2 Watt Heat Load	59.2	°K	-	80
4.2.3.2	Temp after 1/2 Hour	53.6	°K	-	80
4.2.3.3	Cold Finger Warm End Temp	-32	°C	Info	Only
4.2.3.4	Input Volts 17 VDC Current 1.1 ADC Stablized Power 18.7	18.7	Watts	-	30
4.2.3.5	Temp with 0.2 Watt Head Load	63.1	°K	-	80
4.2.3.5	Cold Finger Warm End Temp	-33	°C	Info	Only
4.2.3.5	Input Volts 32 VDC Current .63 ADC F.B.- O.K Power	20.16	Watts	-	30
4.2.4	Test at 71°C Horiz; Turn-on Current	1.25	Amps	Info	
4.2.4.1	Cooldown Time to 100°K	5.8	Minutes	-	7.5
4.2.4.1	Cooldown Time to 80°K	6.7	Minutes	-	10
4.2.4.1	Stabl. Temp. with 0.2 Watt Heat Load	68.3	°K	-	80
4.2.4.1	Temp after 1/2 hour	67.6	°K	-	80
4.2.4.2	Cold Finger Warm End Temp	79	°C	Info	Only
4.2.4.3	Input Volts 17 VDC Current 1.6 ADC Power	27.2	Watts	-	35
4.2.4.4	Stabl. Temp with 0.2 Watt Head Load	69.4	°K	-	80
4.2.4.4	Cold Finger Warm End Temp	78	°C	Info	Only
4.2.4.4	Input Volts 32 VDC Current ADC .88 F.B- O.K. Power	28.2	Watts	-	35

7/28/82

PERFORMANCE TEST

DATA SHEET

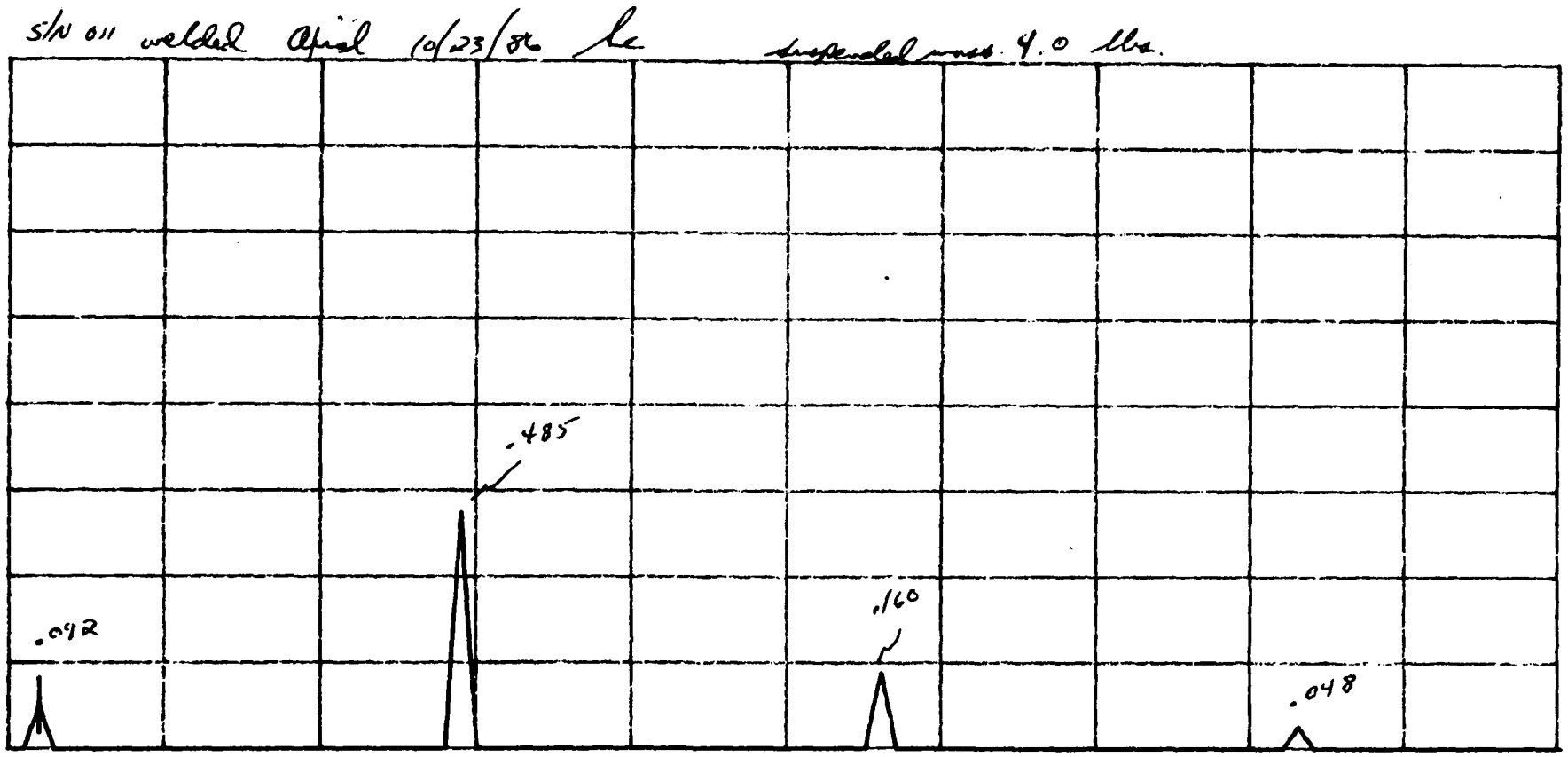
COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC SERIAL NO. 11
DRAWING NO. SM-D-5005863/SM-D-5005842

TEST PLAN PARA	PARAMETER	MEASURED	UNITS	LIMITS MIN	LIMITS MAX
4.2.5	Test at 23°C Vertical; Turn-on Current	1.05	Amps	Info	
4.2.5.1	Cooldown Time to 100°K	5.0	Minutes	-	7.5
4.2.5.1	Cooldown Time to 80°K	5.7	Minutes	-	10
4.2.5.1	Minimum Temp	50.4	°K		80
4.2.5.2	Stabl. Temp with 0.35 Watt Heat Load	65.6	°K	-	80
4.2.5.3	Temp After 1/2 Hour With Heat Load	68.1	°K	Info	80
4.2.5.4	Cold Finger Warm End Temp	31	°C	Info	Only
4.2.5.5	Input Volts 17 VDC Current 1.35 ADC Power	23.0	Watts	-	30
4.2.5.6	Stabl. Temp. with 0.35 Watt Heat Load	72.0	°K		80
4.2.5.6	Cold Finger Warm End Temp	31	°C	Info	Only
4.2.5.6	Input Volt 32 VDC Current .75 ADC F.B - O.K. Power	24.0	Watts	-	30
4.2.6	Leakage Rate	1.8×10^{-9}	STP CC/SEC	-	2.7×10^{-7}

PERFORMED BY S. Cooper DATE 28 JULY 86 · 29 JULY 8

WITNESSED BY [signature] Q.A. MAGNAVOX TIME: 1:00 P.M. · 8:30 A

WITNESSED BY _____ Q.A. CUSTOMER



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SPAN: 50.00HZ -250.00HZ SN: 7.1+00V FS: 1.4+00R 1.8-01R/

Magnavox
ELECTRO-OPTICAL SYSTEMS
P.O. Box 619, 40 Industrial Avenue, Mahwah, N.J. 07430-0619
TEL: 201-529-1700 TWX: 710-988-5672

PERFORMANCE TEST
VIBRATION OUTPUT TEST DATA
1/4 WATT LINEAR RESONANT CRYOGENIC COOLER
MM & T PROGRAM

DRAWING NO.: SM-D-~~5~~5843 SERIAL NO.: 011

Test Plan Para	Frequency	Maximum Force Along Compressor Axis, ± lbs	Measure Force Along Compressor Axis, lbs.	Maximum Force In Any Compressor Radial Axis, ± lbs	Measured Force In Any compressor Radial 0° Axis, lbs.	90°
4.3.9	Fundamental (54 Hz)	1.0	0.53	1.5	0.87	0.80
	1st Harmonic (108 Hz)	2.5	1.55	0.22	0.08	0.08
	2nd Harmonic (162 Hz)	1.4	0.54	0.13	0.07	0.02
	3rd Harmonic (216 Hz)	0.30	0.13	0.13	0.05	0.03
	Next 37 Harmonics	0.10	SEE GRAPH	0.10	SEE GRAPH	

PERFORMED BY: S. Cavagno DATE: 9/8/86

WITNESSED BY: _____ CUSTOMER Q.A.

_____ MAGNAVOX Q.A.

PERFORMANCE TEST

VIBRATION OUTPUT TEST DATA

½ WATT LINEAR RESONANT CRYOGENIC COOLER

MM&T PROGRAM

Test Plan Paragraph: 4.3.9

Cooler S/N: 011 Total Suspended Weight 4.2 Date: 9/8/86

S/N	Freq.	Force Along Compressor Axis		Force Along Radial Axis				
				Axis*1		Axis*2		
		g's	lbs	g's	lbs	g's	lbs	
1	54	.125	0.53	0.206 ~~.506~~	0.87	.189	0.80	
2	108	.369	1.55	.019 ~~.0047~~	0.08	.020	0.08	
3	162	.129	0.54	.016 ~~.0414~~	0.07	.004	0.02	
4	216	.030	0.13	.011 ~~.005~~	0.05	.008	0.03	
5	270	.009	0.04	.008	0.03	.009	0.04	
6	324	.005	0.02	.015	0.06	.003	0.01	
7	378	.008	0.03	.006	0.03	.012	0.05	
8	432	.004	0.02	.011	0.05	.005	0.02	
9	486	.002	0.01	.005	0.02	.010	0.04	
10	540	.002	0.01	.002	0.01	.007	0.03	
11	594	.002	0.01	.008	0.03	.003	0.01	
12	648	.003	0.01	.002	0.01	.007	0.03	
13	702	.002	0.01	.006	0.03	.008	0.03	
14	756	.001	0.004	.002	0.01	.003	0.01	
15	810	.002	0.01	.003	0.01	.006	0.03	

Con't Page 2

* Axis 1 = along transfer tube
  Axis 2 = perpendicular to axis 1

Performed by: A. Carrigan Date: 9/8/86

Witnessed By: _____

Customer QA

Magnavox QA

PERFORMANCE TEST

VIBRATION OUTPUT TEST DATA

¼ WATT LINEAR RESONANT CRYOGENIC COOLER

MM&T PROGRAM

Test Plan Paragraph: 4.3.9

Cooler S/N: 011 Total Suspended Weight 4.2 lbs Date: 9-8-86

S/N	Freq.	Force Along Compressor Axis		Force Along Radial Axis				
		g's	lbs	g's	Axis*1 lbs	g's	Axis*2 lbs	
16	864	.002	0.01	.003	0.01	.007	0.030	
17	918	.003	0.01	.001	0.004	.0005	0.002	
18	972	.001	0.004	.002	0.010	.004	0.017	
19	1026	.0005	0.002	.001	0.004	.002	0.01	
20	1080	.001	0.004	.006	0.030	.001	0.004	
21	1134	.001	0.004	.001	0.004	.001	0.004	
22	1188	.001	0.004	.002	0.010	.001	0.004	
23	1242	.001	0.004	.005	0.020	.002	0.01	
24	1296	.002	0.01	.003	0.010	.001	0.004	
25	1350	.0005	0.002	.0007	0.003	.002	0.01	
26	1404	.001	0.004	.001	0.004	.002	0.01	
27	1458	.001	0.004	.0005	0.002	.001	0.004	

Con't Page 3

*Axis 1 = along transfer tube
Axis 2 = perpendicular to axis 1

Performed By: A. Carrasco Date: _____

Witnessed By: _____ Customer QA

_____ Magnavox QA

PERFORMANCE TEST

VIBRATION OUTPUT TEST DATA

½ WATT LINEAR RESONANT CRYOGENIC COOLER

MM&T PROGRAM

Test Plan Paragraph: 4.3.9

Cooler S/N: 011 Total Suspended Weight 4.2 lbs Date: 9-8-86

S/N	Freq.	Force Along Compressor Axis		Force Along Radial Axis				
				Axis*1		Axis*2		
		g's	lbs	g's	lbs	g's	lbs	
28	1512	.001	0.004	.0006	0.003	.002	0.010	
29	1566	.001	0.004	.0006	0.003	.004	0.020	
30	1620	.0005	0.002	.001	0.004	.003	0.010	
31	1674	.001	0.004	.0005	0.002	.001	0.004	
32	1728	.001	0.004	.001	0.004	.001	0.004	
33	1782	.0005	0.002	.002	0.010	.001	0.004	
34	1836	.0005	0.002	.002	0.010	.001	0.004	
35	1890	.001	0.004	.001	0.004	.001	0.004	
36	1944	.001	0.004	.0005	0.002	.002	0.010	
37	1998	.001	0.004	.001	0.004	.0005	0.002	
38	2052	.0007	0.003	.0005	0.002	.0005	0.002	
39	2106	.001	0.004	.001	0.004	.001	0.004	
40	2160	.0005	0.002	.0008	0.003	.001	0.004	
41	2214	.002	0.010	.0005	0.002	.0005	0.002	

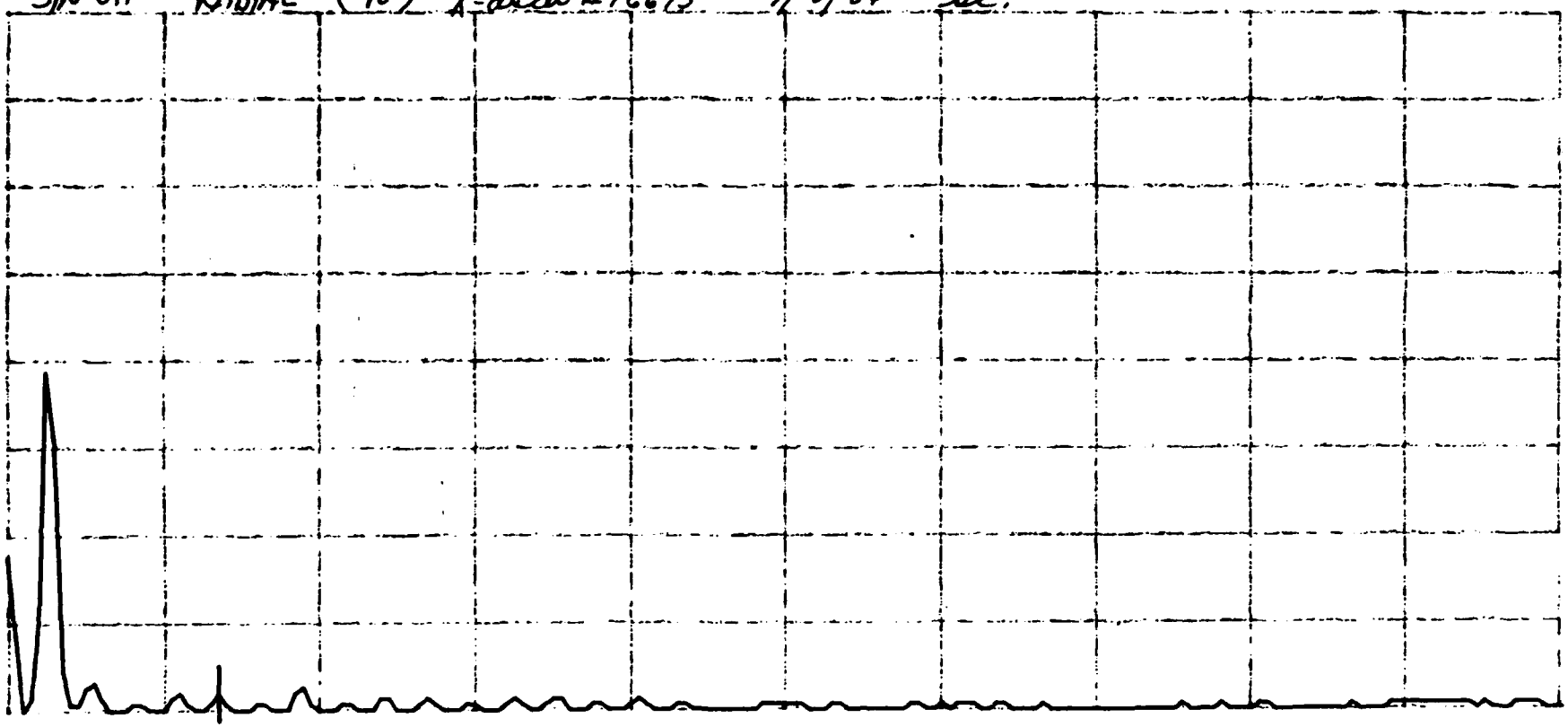
*Axis 1 = along transfer tube
Axis 2 = perpendicular to axis 1

Performed By: A. Campos Date: _____

Witnessed By: _____ Customer QA

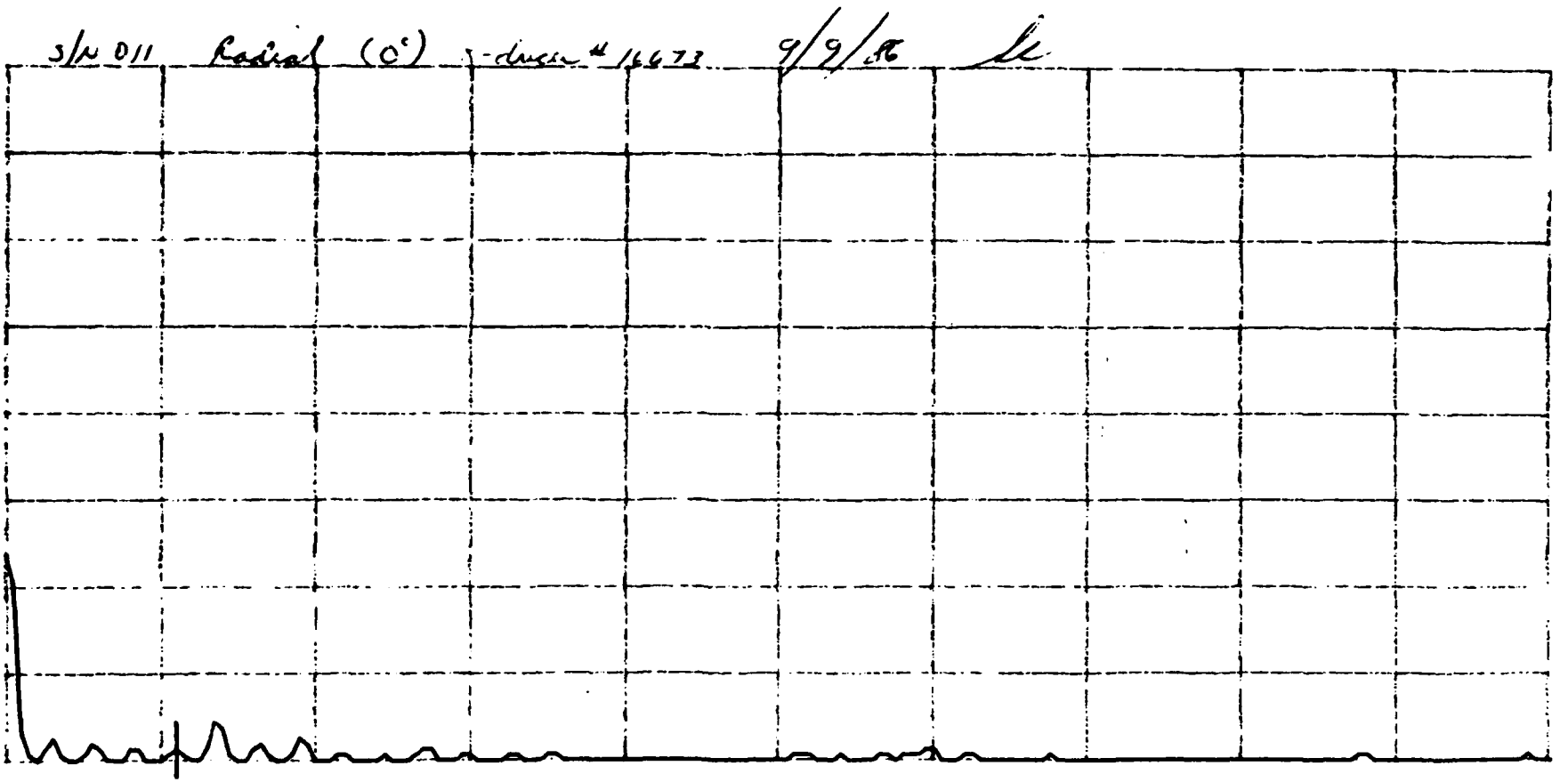
_____ Magnavox QA

S/N 011 RADIAL (90°) x-driver #16673 9/8/86 dc.



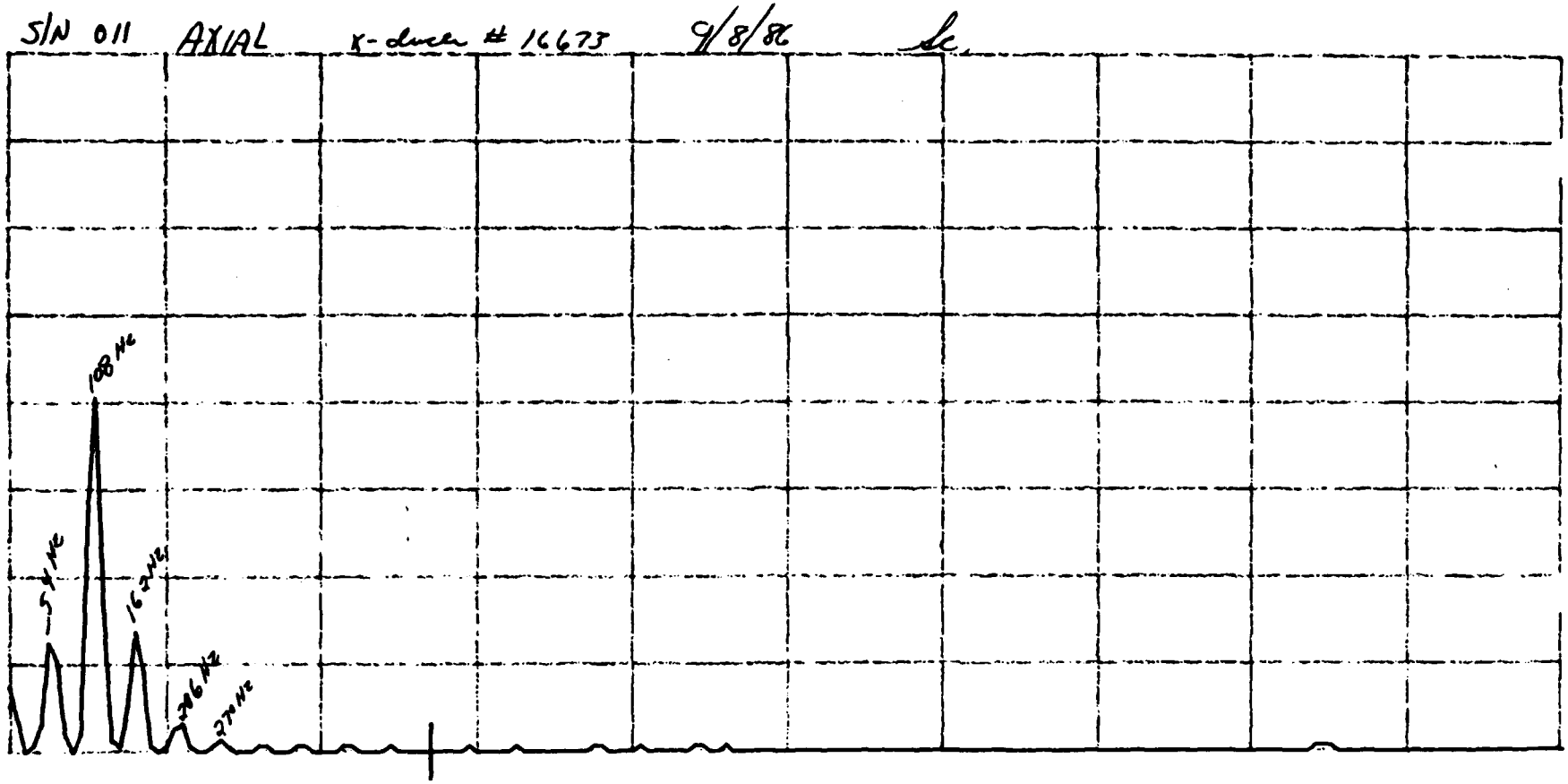
PWR SPECT B : 9.12E-03R 270. HZ N: NONE F: 10HZ

SPAN: 0.000HZ -2.0000KHZ SN: 4.5+00V FS: 4.5-01R 5.6-02R/



PWR SPECT B : 9.98E-03R 270. HZ N: NONE F: 10HZ

SPAN: 50.00HZ -2.0500KHZ SN: 3.2+00V FS: 6.3-01R 7.9-02R/



PWR SPECT B : 8.32E-04R 540. HZ N: NONE P: 10HZ

SPAN: 0.000HZ -2.0000KHZ SN: 3.5+00V FS: 7.1-01R 8.9-02R/

PERFORMANCE TEST

DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC SERIAL NO. 013
DRAWING NO. SM-D-5005863/SM-D-5005842

TEST PLAN PARA	PARAMETER	MEASURED	UNITS	LIMITS MIN	LIMITS MAX
3.10	Calibration Check	Complies	-	Comply	
4.1.1	Inspection to SM-D-5005863/5005842	Complies	-	Comply	
4.1.2	Weight	2.34	Lbs	-	2.5
4.1.3.1	Pressurization	33.0	PSIG	Info	Only
4.1.3.2	Leakage Rate	2×10^{-9}	STP CC/SEC	-	2.7×10^{-7}
4.2.2	Test at 23°C Horiz; Turn-on Current	.86	Amps	Info	
4.2.2	Cooldown Time to 100°K	5.5	Minutes	-	7.5
4.2.2	Cooldown Time to 80°K	6.8	Minutes	-	10
4.2.2	Minimum Temp	47.2	°K	Info	80
4.2.2.1	Stabl. Temp. with 0.35 Watt Heat Load	68.9	°K		80
4.2.2.2	Temp. after 1/2 Hour Operation	69.1	°K	-	80
4.2.2.3	Cold Finger warm end temp	34	°C	Info	Only
4.2.2.4	Input Volt 17 VDC Current 1.25 ADC F.B.-OK Power 21.25	21.2	Watts	-	30
4.2.2.5	Stabl. Temp with 0.35 Watt Heat Load	71.9	°K		80
4.2.2.5	Cold Finger Warm End Temp	34	°C	Info	Only
4.2.2.5	Input Volts 32 VDC Current .68 ADC Power 21.76	21.8	Watts	-	30
4.2.3	Test at -40°C Horiz; Turn-on Current	1.1	Amps	Info	
4.2.3.1	Cooldown Time to 100°K	6.7	Minutes	-	7.5
4.2.3.1	Cooldown Time to 80°K	7.5	Minutes	-	10
4.2.3.2	Stabl. Temp with 0.2 Watt Heat Load	52.4	°K	-	80
4.2.3.2	Temp after 1/2 Hour	50.9	°K	-	80
4.2.3.3	Cold Finger Warm End Temp	-30	°C	Info	Only
4.2.3.4	Input Volts 17 VDC Current 1.13 ADC Stablized Power 19.21	19.2	Watts	-	30
4.2.3.5	Temp with 0.2 Watt Head Load	53.9	°K	-	80
4.2.3.5	Cold Finger Warm End Temp	-31	°C	Info	Only
4.2.3.5	Input Volts 32 VDC Current .62 ADC F.B.- OK. Power	19.8	Watts	-	30
4.2.4	Test at 71°C Horiz; Turn-on Current	1.16	Amps	Info	
4.2.4.1	Cooldown Time to 100°K	6.4	Minutes	-	7.5
4.2.4.1	Cooldown Time to 80°K	7.5	Minutes	-	10
4.2.4.1	Stabl. Temp. with 0.2 Watt Heat Load	69.8	°K	-	80
4.2.4.1	Temp after 1/2 hour	69.4	°K	-	80
4.2.4.2	Cold Finger Warm End Temp	84	°C	Info	Only
4.2.4.3	Input Volts 17 VDC Current 1.43 ADC Power	24.3	Watts	-	35
4.2.4.4	Stabl. Temp with 0.2 Watt Head Load	71.6	°K	-	80
4.2.4.4	Cold Finger Warm End Temp	83	°C	Info	Only
4.2.4.4	Input Volts 32 VDC Current ADC .80 F.B- O.K. Power	25.6	Watts	-	35

TEST PERFORMED BY : S. Cooper

TEST DATE : 28 JULY 86 29 JULY 86

TIME : 1:00 P.M. 8:30 A.M.

7/28/86

PERFORMANCE TEST

DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC — SERIAL NO. 13
DRAWING NO. SM-D-5005863/SM-D-5005842

TEST PLAN PARA	PARAMETER	MEASURED	UNITS	LIMITS MIN	LIMITS MAX
4.2.5	Test at 23°C Vertical; Turn-on Current	MAY TO 081	Amps	Info	
4.2.5.1	Cooldown Time to 100°K	5.4	Minutes	-	7.5
4.2.5.1	Cooldown Time to 80°K	6.1	Minutes	-	10
4.2.5.1	Minimum Temp	49	°K		80
4.2.5.2	Stabl. Temp with 0.35 Watt Heat Load	71.1	°K	-	80
4.2.5.3	Temp After 1/2 Hour With Heat Load	71.5	°K	Info	80
4.2.5.4	Cold Finger Warm End Temp	35	°C	Info	Only
4.2.5.5	Input Volts 17 VDC Current 1.25 ADC Power	21.3	Watts	-	30
4.2.5.6	Stabl. Temp. with 0.35 Watt Heat Load	73.4	°K		80
4.2.5.6	Cold Finger Warm End Temp	35	°C	Info	Only
4.2.5.6	Input Volt 32 VDC Current .72 ADC F.B - O.K. Power	23.0	Watts	-	30
4.2.6	Leakage Rate	4.4×10^{-9}	STP CC/SEC	-	2.7×10^{-7}

PERFORMED BY S. Cooper — DATE 28 July 86 (29 July 86)

WITNESSED BY [signature] Q.A. MAGNAVOX — TIME: 1.00 p.m. (8.30 A.)

WITNESSED BY _____ Q.A. CUSTOMER

Magnavox
ELECTRO-OPTICAL SYSTEMS
P.O. BOX 615, 46 INDUSTRIAL AVENUE, JOHNSON, N.J. 07825-0615
TEL: 201-527-1700 TWX: 710-988-5672

PERFORMANCE TEST
VIBRATION OUTPUT TEST DATA
1/4 WATT LINEAR RESONANT CRYOGENIC COOLER
MM & T PROGRAM

DRAWING NO.: SM-D-5702543 SERIAL NO.: 013

Test Plan Para	Frequency	Maximum Force Along Compressor Axis, ± lbs	Measure Force Along Compressor Axis, lbs.	Maximum Force In Any Compressor Radial Axis, ± lbs	Measured Force In Any compressor Radial 0° Axis, lbs.	90°
4.3.9	Fundamental (54 Hz)	1.0	.55	1.5	.7	.15
	1st Harmonic (108 Hz)	2.5	2.10	0.22	.06	.13
	2nd Harmonic (162 Hz)	1.4	.57	0.13	.03	.03
	3rd Harmonic (216 Hz)	0.30	.26	0.13	.01	.02
	Next 37 Harmonics	0.10	SEE GRAPH	0.10	SEE GRAPH	

PERFORMED BY: S. Carriger DATE: 9/8/86

WITNESSED BY: _____ CUSTOMER Q.A.

_____ MAGNAVOX Q.A.

PERFORMANCE TEST

VIBRATION OUTPUT TEST DATA

½ WATT LINEAR RESONANT CRYOGENIC COOLER

MM&T PROGRAM

Test Plan Paragraph: 4.3.9

Cooler S/N: 013 Total Suspended Weight 4.2 lbs Date: 9-5-86

S/N	Freq.	Force Along Compressor Axis		Force Along Radial Axis				
				Axis*1		Axis*2		
		g's	lbs	g's	lbs	g's	lbs	
1	54	.132	0.55	.167	0.70	.036	0.15	
2	108	.500	2.10	.015	0.06	.031	0.13	
3	162	.136	0.57	.007	0.03	.007	0.03	
4	216	.063	0.26	.003	0.01	.005	0.02	
5	270	.021		.002		.002		
6	324	.033		.009		.009		
7	378	.012		.007		.012		
8	432	.006		.003		.007		
9	486	.0005		.001		.003		
10	540	.003		.003		.001		
11	594	.001		.001		.0009		
12	648	.002		.004		.002		
13	702	.001		.007		.007		
14	756	.001		.008		.015		
15	810	.0001		.007		.009		

Con't Page 2

* Axis 1 = along transfer tube
  Axis 2 = perpendicular to axis 1

Performed by: A. Cavagna Date: _____

Witnessed By: _____

Customer QA

Magnavox QA

PERFORMANCE TEST

VIBRATION OUTPUT TEST DATA

½ WATT LINEAR RESONANT CRYOGENIC COOLER

MM&T PROGRAM

Test Plan Paragraph: 4.3.9

Cooler S/N: 013 Total Suspended Weight 4.2 lbs Date: 9-5-86

S/N	Freq.	Force Along Compressor Axis		Force Along Radial Axis				
				Axis*1		Axis*2		
		g's	lbs	g's	lbs	g's	lbs	
16	864	.0001		.002		.005		
17	918	.0001		.001		.002		
18	972	.0001		.001		.001		
19	1026	.0001		.001		.002		
20	1080	.0001		.005		.002		
21	1134	.0001		.004		.001		
22	1188	.001		.002		.001		
23	1242	.001		.001		.001		
24	1296	.001		.001		.0005		
25	1350	.003		.0009		.0004		
26	1404	.0005		.0008		.0005		
27	1458	.001		.002		.0005		

Con't Page 3

*Axis 1 = along transfer tube
Axis 2 = perpendicular to axis 1

Performed By: A. Carrington Data: _____

Witnessed By: _____ Customer QA

_____ Magnavox QA

PERFORMANCE TEST

VIBRATION OUTPUT TEST DATA

¼ WATT LINEAR RESONANT CRYOGENIC COOLER

MM&T PROGRAM

Test Plan Paragraph: 4.3.9

Cooler S/N: 013 Total Suspended Weight 4.2 Date: 9-5-86

S/N	Freq.	Force Along Compressor Axis		Force Along Radial Axis				
				Axis*1		Axis*2		
		g's	lbs	g's	lbs	g's	lbs	
28	1512	.0005		.003		.002		
29	1566	.001		.002		.0003		
30	1620	.002		.001		.0009		
31	1674	.001		.001		.0003		
32	1728	.0009		.001		.0002		
33	1782	.001		.001		.0008		
34	1836	.001		.001		.0007		
35	1890	.001		.0009		.0009		
36	1944	.0009		.0005		.0009		
37	1998	.0007		.0004		.0005		
38	2052	.0008		.0003		.0002		
39	2106	.0004		.0006		.0001		
40	2160	.0007		.0009		.0001		
41	2214	.0002		.002		.0003		

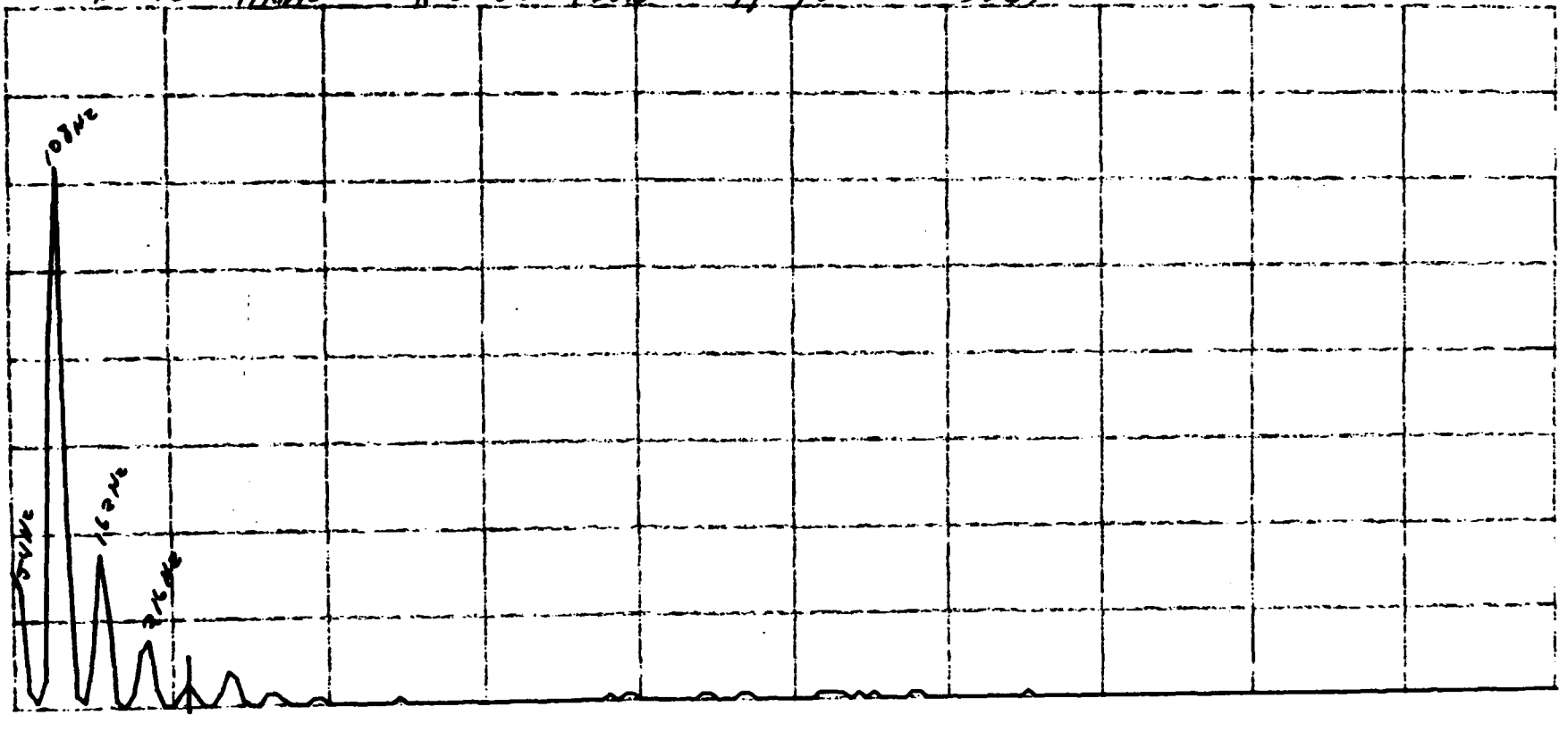
*Axis 1 = along transfer tube
Axis 2 = perpendicular to axis 1

Performed By: S. Campos Date: _____

Witnessed By: _____ Customer QA

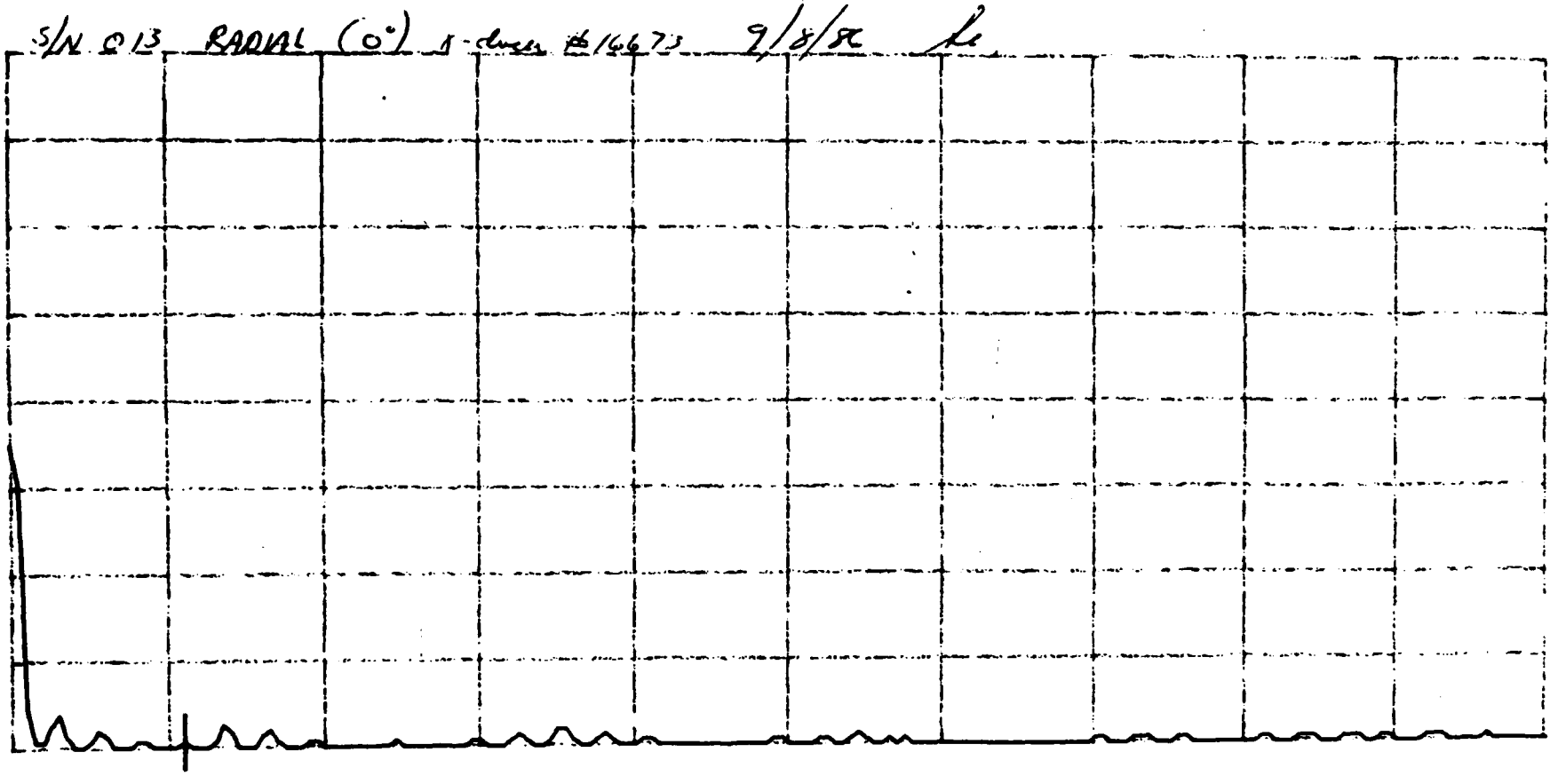
_____ Magnavox QA

S/N 013 AXIAL X-ducer #16677 9/5/86 [illegible]



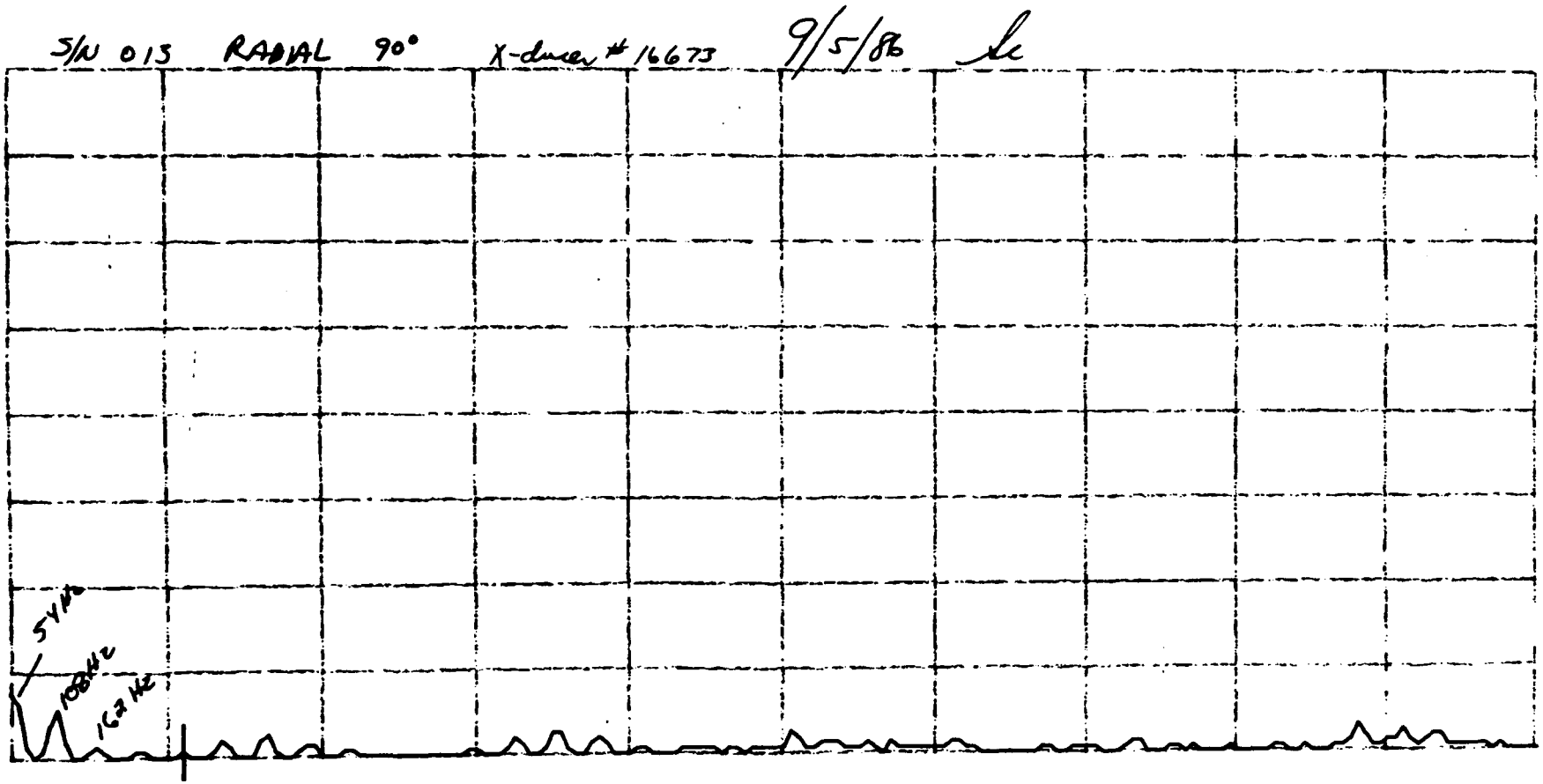
PWR SPECT B : 2.09E-02R 270. HZ N: NONE P: 1CHZ

SPAN: 50.00HZ -2.0500KHZ SN: 3.2+00V FS: 6.3-01R 7.9-02R/



PWR SPECT B : 1.83E-03R 270. HZ N: NONE P: 10HZ

SPAN: 50.00HZ -2.0500KHZ SN: 4.5+00V FS: 4.5-01R 5.6-02R/



PWR SPECT B : 3.40E-03R 270. HZ N: NONE P: 1CHZ

SPAN: 50.00HZ -2.0500KHZ SN: 2.2+00V FS: 4.5-01R 5.6-02R/

PERFORMANCE TEST

DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC. SERIAL NO. 015
DRAWING NO. SM-D-5005863/SM-D-5005842

TEST PLAN PARA	PARAMETER	MEASURED	UNITS	LIMITS MIN	LIMITS MAX
3.10	Calibration Check	Complies	-	Comply	
4.1.1	Inspection to SM-D-5005863/5005842	Complies	-	Comply	
4.1.2	Weight	2.34	Lbs	-	2.5
4.1.3.1	Pressurization	330	PSIG	Info	Only
4.1.3.2	Leakage Rate	1.8×10^{-7}	STP CC/SEC	-	2.7×10^{-7}
4.2.2	Test at 23°C Horiz; Turn-on Current	.95	Amps	Info	
4.2.2	Cooldown Time to 100°K	5.3	Minutes	-	7.5
4.2.2	Cooldown Time to 80°K	6.0	Minutes	-	10
4.2.2	Minimum Temp	39.5	°K	Info	80
4.2.2.1	Stabl. Temp. with 0.35 Watt Heat Load	67.7	°K		80
4.2.2.2	Temp. after 1/2 Hour Operation	67.9	°K	-	80
4.2.2.3	Cold Finger warm end temp	34	°C	Info	Only
4.2.2.4	Input Volt 17 VDC Current 1.42 ADC Power 24.14	24.1	Watts	-	30
4.2.2.5	Stabl. Temp with 0.35 Watt Heat Load	72.3	°K		80
4.2.2.5	Cold Finger Warm End Temp	34	°C	Info	Only
4.2.2.5	Input Volts 32 VDC Current .77 ADC FB. OK Power 24.6	24.6	Watts	-	30
4.2.3	Test at -40°C Horiz; Turn-on Current	1.05	Amps	Info	
4.2.3.1	Cooldown Time to 100°K	6.6	Minutes	-	7.5
4.2.3.1	Cooldown Time to 80°K	7.3	Minutes	-	10
4.2.3.2	Stabl. Temp with 0.2 Watt Heat Load	46.7	°K	-	80
4.2.3.2	Temp after 1/2 Hour	46.8	°K	-	80
4.2.3.3	Cold Finger Warm End Temp	-31	°C	Info	Only
4.2.3.4	Input Volts 17 VDC Current 1.53 ADC Stablized Power 26.01	26.0	Watts	-	30
4.2.3.5	Temp with 0.2 Watt Head Load	49.3	°K	-	80
4.2.3.5	Cold Finger Warm End Temp	-31	°C	Info	Only
4.2.3.5	Input Volts 32 VDC Current .82 ADC FB. OK Power 26.24	26.2	Watts	-	30
4.2.4	Test at 71°C Horiz; Turn-on Current	1.10	Amps	Info	
4.2.4.1	Cooldown Time to 100°K	5.9	Minutes	-	7.5
4.2.4.1	Cooldown Time to 80°K	6.9	Minutes	-	10
4.2.4.1	Stabl. Temp. with 0.2 Watt Heat Load	69.1	°K	-	80
4.2.4.1	Temp after 1/2 hour	67.8	°K	-	80
4.2.4.2	Cold Finger Warm End Temp	81	°C	Info	Only
4.2.4.3	Input Volts 17 VDC Current 1.52 ADC F.B. O.K. Power 25.84	25.8	Watts	-	35
4.2.4.4	Stabl. Temp with 0.2 Watt Head Load	68.2	°K	-	80
4.2.4.4	Cold Finger Warm End Temp	32	°C	Info	Only
4.2.4.4	Input Volts 32 VDC Current ADC .85 Power	27.2	Watts	-	35

28.9 Watts

PERFORMED BY: Richard V. Finkbeiner

7/17/86

-40°C
71°C
>30°C

23°C, 7/16/86

PERFORMANCE TEST

DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC SERIAL NO. 015
DRAWING NO. SM-D-5005863/SM-D-5005842

TEST PLAN PARA	PARAMETER	MEASURED	UNITS	LIMITS MIN	LIMITS MAX
4.2.5	Test at 23°C Vertical; Turn-on Current	1.0	Amps	Info	
4.2.5.1	Cooldown Time to 100°K	5.3	Minutes	-	7.5
4.2.5.1	Cooldown Time to 80°K	6.1	Minutes	-	10
4.2.5.1	Minimum Temp	39.7	°K		80
4.2.5.2	Stabl. Temp with 0.35 Watt Heat Load	68.4	°K	-	80
4.2.5.3	Temp After 1/2 Hour With Heat Load	68.4	°K	Info	80
4.2.5.4	Cold Finger Warm End Temp	34.	°C	Info	Only
4.2.5.5	Input Volts 17 VDC Current 1.37 ADC FB-OK Power 23.29	23.3	Watts	-	30
4.2.5.6	Stabl. Temp. with 0.35 Watt Heat Load	69.4	°K		80
4.2.5.6	Cold Finger Warm End Temp	34	°C	Info	Only
4.2.5.6	Input Volt 32 VDC Current .77 ADC Power 24.64	24.6	Watts	-	30
4.2.6	Leakage Rate	2.3×10^{-7}	STP CC/SEC	-	2.7×10^{-7}

PERFORMED BY [signature] DATE 7/16/86 7/17/86

WITNESSED BY [signature] Q.A. MAGNAVOX

WITNESSED BY _____ Q.A. CUSTOMER

Magnavox
ELECTRO-OPTICAL SYSTEMS

PERFORMANCE TEST
VIBRATION OUTPUT TEST DATA
1/4 WATT LINEAR RESONANT CRYOGENIC COOLER
MM & T PROGRAM

DRAWING NO.: SM-D-500 5843. SERIAL NO.: C15

Test Plan Para	Frequency	Maximum Force Along Compressor Axis, ± lbs	Measure Force Along Compressor Axis, lbs.	Maximum Force In Any Compressor Radial Axis, ± lbs	Measured Force In Any compressor Radial 0° Axis, lbs.	90°
4.3.9	Fundamental (54 Hz)	1.0	0.42	1.5	0.14	0.47
	1st Harmonic (108 Hz)	2.5	1.93	0.22	0.06	0.70
	2nd Harmonic (162 Hz)	1.4	0.71	0.13	0.03	0.02
	3rd Harmonic (216 Hz)	0.30	0.20	0.13	0.02	0.03
	Next 37 Harmonics	0.10	SEE GRAPH	0.10	SEE	GRAPH

PERFORMED BY: A. Conejo DATE: 9/8/87

WITNESSED BY: CUSTOMER Q.A.

MAGNAVOX Q.A.

PERFORMANCE TEST

VIBRATION OUTPUT TEST DATA

¼ WATT LINEAR RESONANT CRYOGENIC COOLER

MM&T PROGRAM

Test Plan Paragraph: 4.3.9

Cooler S/N: 015 Total Suspended Weight 4.1 lbs Date: 9-5-86

S/N	Freq.	Force Along Compressor Axis		Force Along Radial Axis				
				Axis*1		Axis*2		
		g's	lbs					
	54	0.102	0.42	0.033	0.14	0.114	0.47	
	108	0.470	1.93	0.015	0.06	0.016	0.70	
	162	0.174	0.71	0.007	0.03	0.005	0.02	
	216	0.048	0.20	0.004	0.02	0.007	0.03	
	270	0.021		0.018		0.017		
	324	0.023		0.065		0.080		
	378	0.012		0.033		0.026		
	432	0.001		0.021		0.041		
	486	0.006		0.029		0.027		
	540	0.003		0.019		0.038		
	594	0.005		0.024		0.025		
	648	0.012		0.037		0.029		
	702	0.042		0.017		0.063		
	756	0.014		0.083		0.059		
	810	0.007		0.036		0.044		

Con't Page 2

Axis 1 = along transfer tube
Axis 2 = perpendicular to axis 1

Witnessed by: _____ Date: _____

Witnessed By: _____ Customer QA

Hamilton QA

PERFORMANCE TEST

VIBRATION OUTPUT TEST DATA

½ WATT LINEAR RESONANT CRYOGENIC COOLER

MM&T PROGRAM

Test Plan Paragraph: 4.3.9

Cooler S/N: 015 Total Suspended Weight 4.1 lbs Date: 9-5-86

S/N	Freq.	Force Along Compressor Axis		Force Along Radial Axis				
				Axis*1		Axis*2		
		g's	lbs	g's	lbs	g's	lbs	
16	864	0.008		0.048		0.011		
17	918	0.005		0.008		0.015		
18	972	0.001		0.005		0.016		
19	1026	0.006		0.007		0.002		
20	1080	0.009		0.010		0.012		
21	1134	0.008		0.013		0.014		
22	1188	0.008		0.023		0.010		
23	1242	0.011		0.006		0.014		
24	1296	0.003		0.012		0.013		
25	1350	0.004		0.006		0.007		
26	1404	0.008		0.006		0.005		
27	1458	0.008		0.007		0.004		

Con't Page 3

*Axis 1 = along transfer tube
Axis 2 = perpendicular to axis 1

Performed By: _____ Date: _____

Witnessed By: _____ Customer QA

_____ Magnavox QA

PERFORMANCE TEST

VIBRATION OUTPUT TEST DATA

½ WATT LINEAR RESONANT CRYOGENIC COOLER

NM&T PROGRAM

Test Plan Paragraph: 4.3.9

Cooler S/N: 015 Total Suspended Weight 4.1 lbs Date: 9-5-86

S/N	Freq.	Force Along Compressor Axis		Force Along Radial Axis				
				Axis*1		Axis*2		
		g's	lbs	g's		g's	lbs	
28	1512	0.005		0.012		0.008		
29	1566	0.003		0.009		0.004		
30	1620	0.001		0.001		0.008		
31	1674	0.005		0.002		0.004		
2	1728	0.006		0.004		0.001		
33	1782	0.006		0.002		0.005		
34	1836	0.005		0.007		0.009		
35	1890	0.006		0.006		0.011		
36	1944	0.009		0.005		0.005		
37	1998	0.004		0.009		0.003		
38	2052	0.002		0.004		0.004		
39	2106	0.003		0.003		0.002		
40	2160	0.002		0.004		0.003		
41	2214	0.001		0.002		0.002		

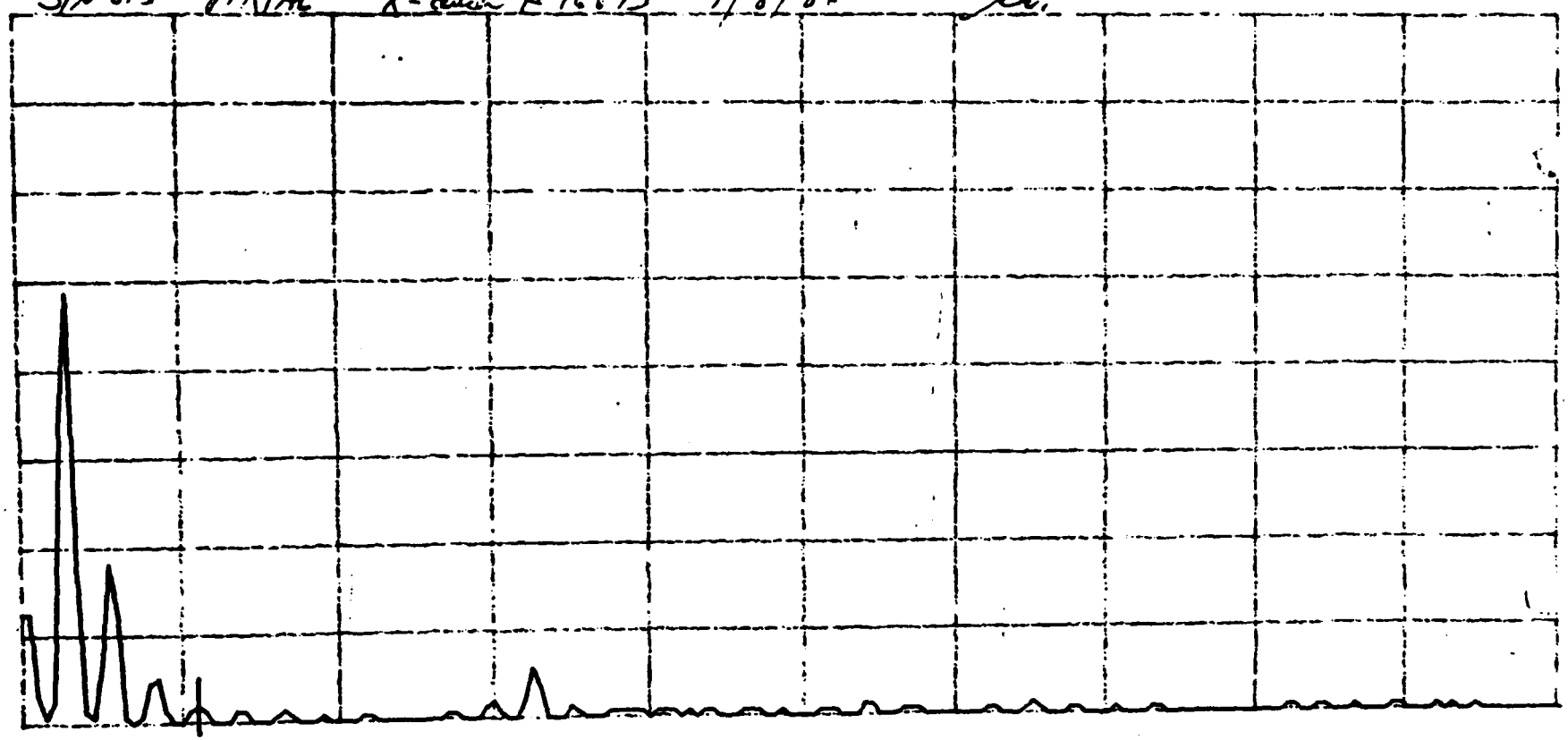
*Axis 1 = along transfer tube
Axis 2 = perpendicular to axis 1

Performed By: _____ Date: _____

Witnessed By: _____ Customer QA

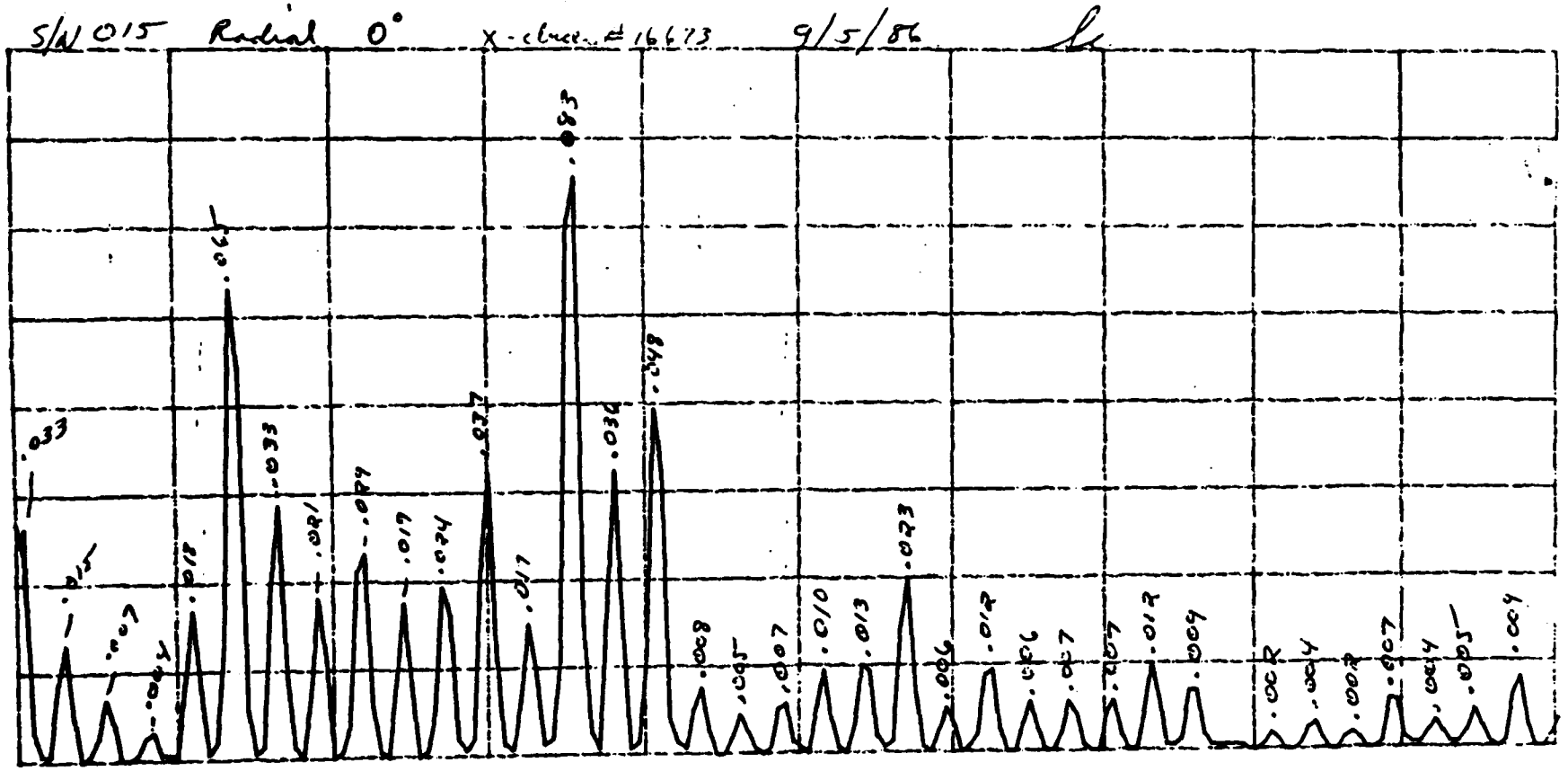
_____ Magnavox QA

S/N 015 AXIAL Δ-down #16673 9/8/86 Lc.



PWR SPECT B : 2.00E-02R 270. HZ N: NONE F: 10HZ

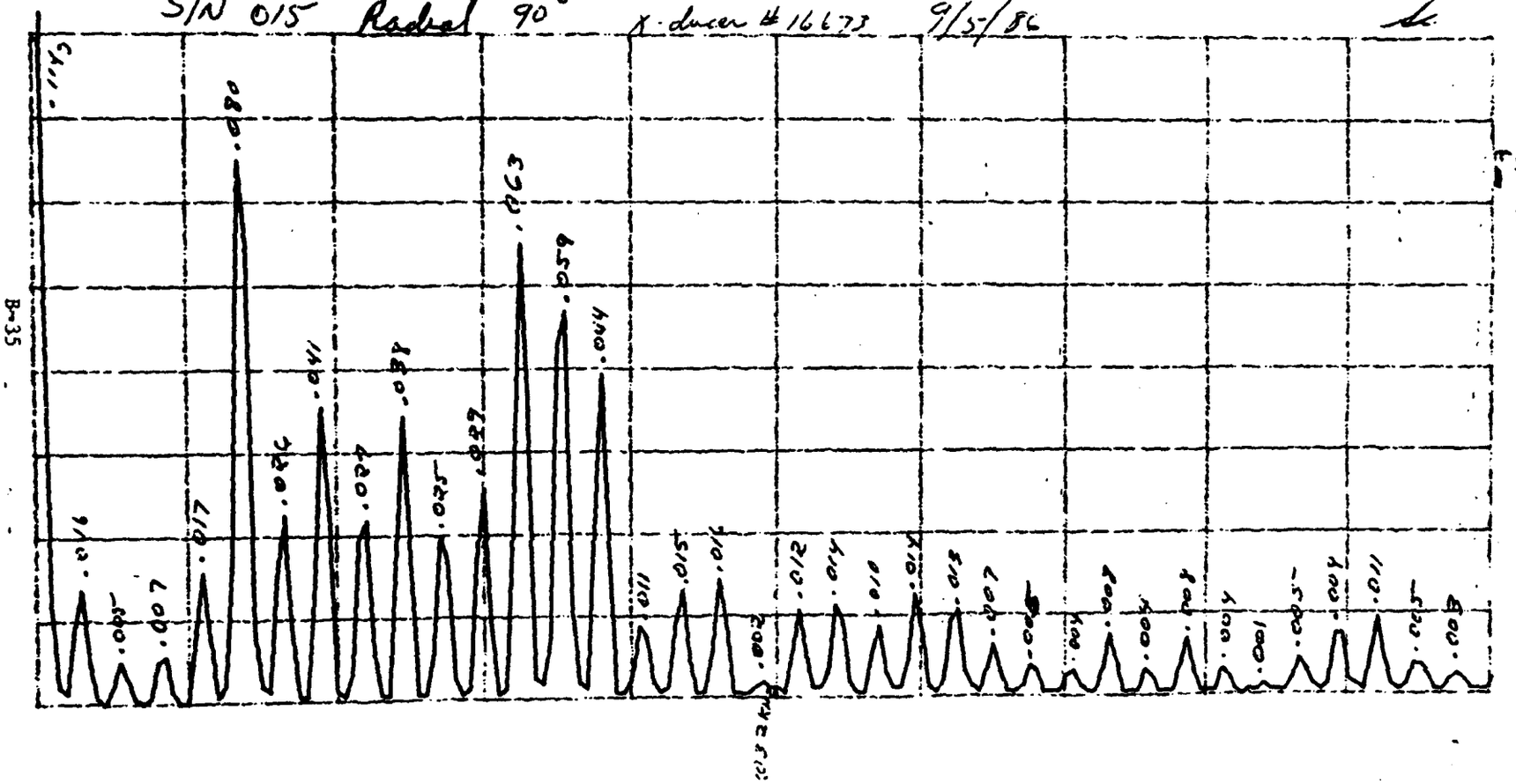
SPAN: 50.00HZ -2.0500KHZ SN: 7.9+00V FS: 7.9-01R 9.9-02R/



PWR SPECT B :2.55E-02R 60. HZ N: NONE P: 10HZ

SPAN: 50.00HZ -2.0500KHZ SN: 4.5+00V FS: 8.9-02R 1.1-02R/

S/N 015 Radial 90° x-ducer #16673 9/5/86



B-35

PWR SPECT B : 9.01E--02R 60. HZ N: 4 B: 10HZ

SPAN: 50.00HZ -2.0500KHZ SN: 4.5+00V FS: 8.9-02R 1.1-02R/

Magnavox
ELECTRO-OPTICAL SYSTEMS
P.O. Box 615, 46 Industrial Avenue, Jonnam, N.J. 07430-0615
TEL: 201-829-1700 TWX: 710-988-5672

Contract No. DAAK20-84-C-0440 PERFORMANCE TEST

Project No. 24407 DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC SERIAL NO. 016
DRAWING NO. SM-D-5005842

TEST PLAN PARA	PARAMETER	MEASURED	UNITS	LIMITS MIN	LIMITS MAX
3.10	Calibration Check	COMPLY	-	Comply	
4.1.1	Inspection to SM-D-5005842	COMPLY	-	Comply	
4.1.2	Weight	2.35	Lbs	-	2.5
4.1.3.1	Pressurization	330	PSIG	Info	Only
4.1.3.2	Leakage Rate	6.0×10^{-9}	STP CC/SEC	-	2.7×10^{-7}
4.2.2	Test at 23°C Horiz; Turn-on Current	N/A	Amps	Info	
4.2.2	Cooldown Time to 100°K	4.2	Minutes	-	7.5
4.2.2	Cooldown Time to 80°K	4.9	Minutes	-	10
4.2.2	Minimum Temp	35.5	°K	Info	80
4.2.2.1	Stabl. Temp. with 0.35 Watt Heat Load	59.5	°K		80
4.2.2.2	Temp. after 1/2 Hour Operation	61.0	°K	-	80
4.2.2.3	Cold Finger warm end temp	39	°C	Info	Only
4.2.2.4	Input Volt 17 VDC Current 1.42 ADC Power	24.14	Watts	-	30
4.2.2.5	Stabl. Temp with 0.35 Watt Heat Load	63.1	°K		80
4.2.2.5	Cold Finger Warm End Temp	39	°C	Info	Only
4.2.2.5	Input Volts 32 VDC Current .88 ADC Power	28.16	Watts	-	30
4.2.3	Test at -40°C Horiz; Turn-on Current	N/A	Amps	Info	
4.2.3.1	Cooldown Time to 100°K	3.8	Minutes	-	7.5
4.2.3.1	Cooldown Time to 80°K	4.4	Minutes	-	10
4.2.3.2	Stabl. Temp with 0.2 Watt Heat Load	49.3	°K	-	80
4.2.3.2	Temp after 1/2 Hour	47.2	°K	-	80
4.2.3.3	Cold Finger Warm End Temp	-30	°C	Info	Only
4.2.3.4	Input Volts 17 VDC Current 1.46 ADC Stablized Power	24.82	Watts	-	30
4.2.3.5	Temp with 0.2 Watt Head Load	50.7	°K	-	80
4.2.3.5	Cold Finger Warm End Temp	-30	°C	Info	Only
4.2.3.5	Input Volts 32 VDC Current .86 ADC Power	27.52	Watts	-	30
4.2.4	Test at 71°C Horiz; Turn-on Current	N/A	Amps	Info	
4.2.4.1	Cooldown Time to 100°K	4.7	Minutes	-	7.5
4.2.4.1	Cooldown Time to 80°K	5.5	Minutes	-	10
4.2.4.1	Stabl. Temp. with 0 2 Watt Heat Load	60.0	°K	-	80
4.2.4.1	Temp after 1/2 hour	65.0	°K	-	80
4.2.4.2	Cold Finger Warm End Temp	89	°C	Info	Only
4.2.4.3	Input Volts 17 VDC Current 1.73 ADC Power	29.41	Watts	-	35
4.2.4.4	Stabl. Temp with 0.2 Watt Head Load	63.2	°K	-	80
4.2.4.4	Cold Finger Warm End Temp	89	°C	Info	Only
4.2.4.4	Input Volts 32 VDC Current ADC 1.02 Power	32.64	Watts	-	35

Performed By: P. HARTMANN Date: 10-23-86

Witnessed By: [signature] Q. A. Magnavox

Witnessed By: [signature] 21 OCT Q. A. Customer

Magnavox
ELECTRO-OPTICAL SYSTEMS
P.O. Box 615, 46 Industrial Avenue, Mahwah, N.J. 07430-0615
TEL: 201-529-1700 TWX: 710-988-5672

Contract: DAAK20-84-C-0440 PERFORMANCE TEST

Project: 24407 DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC SERIAL NO. 016
DRAWING NO. SM-D-5005842

TEST PLAN PARA	PARAMETER	MEASURED	UNITS	LIMITS MIN	LIMITS MAX
4.2.5	Test at 23°C Vertical; Turn-on Current	N/A	Amps	Info	
4.2.5.1	Cooldown Time to 100°K	4.1	Minutes	-	7.5
4.2.5.1	Cooldown Time to 80°K	4.7	Minutes	-	10
4.2.5.1	Minimum Temp	35.5	°K		80
4.2.5.2	Stabl. Temp with 0.35 Watt Heat Load	59.2	°K	-	80
4.2.5.3	Temp After 1/2 Hour With Heat Load	60.1	°K	Info	80
4.2.5.4	Cold Finger Warm End Temp	32	°C	Info	Only
4.2.5.5	Input Volts 17 VDC Current 1.49 ADC Power	25.33	Watts	-	30
4.2.5.6	Stabl. Temp. with 0.35 Watt Heat Load	62.5	°K		80
4.2.5.6	Cold Finger Warm End Temp	33	°C	Info	Only
4.2.5.6	Input Volt 32 VDC Current .89 ADC Power	28.48	Watts	-	30
4.2.6	Leakage Rate	6.0×10^{-9}	STP CC/SEC	-	2.7×10^{-7}

PERFORMED BY P. HARTMANN DATE 10-24-86

WITNESSED BY [signature] Q.A. MAGNAVOX

WITNESSED BY [signature] Q.A. CUSTOMER

31 OCT 1986

Magnavox

ELECTRO-OPTICAL SYSTEMS

P.O. Box 615, 46 Industrial Avenue, Fairfield, N.J. 07430-0615

TEL: 201-882-1700 TWX: 710-989-0672

PERFORMANCE TEST

VIBRATION OUTPUT TEST DATA

1/4 WATT LINEAR RESONANT CRYOGENIC COOLER

MM & T PROGRAM

DRAWING NO.: SM-D-5005842 SERIAL NO.: 016

Test Plan Para	Frequency	Maximum Force Along Compressor Axis, ± lbs	Measure Force Along Compressor Axis, lbs.	Maximum Force In Any Compressor Radial Axis, ± lbs	Measured Force In Any compressor Radial 0° Axis, lbs.	90°
4.3.9	Fundamental (54 Hz)	1.0	.48	1.5	1.3	1.0
	1st Harmonic (108 Hz)	2.5	2.5	0.22	.13	.10
	2nd Harmonic (162 Hz)	1.4	.56	0.13	.03	.05
	3rd Harmonic (216 Hz)	0.30	.24	0.13	.02	.02
	Next 37 Harmonics	0.10	<.10	0.10	<.10	<.10

PERFORMED BY: S. Caciopoli DATE: 10/23/86

WITNESSED BY: 23 OCT 1986 CUSTOMER Q.A.

DCAS-DAR 53101 A

MAGNAVOX Q.A.

PERFORMANCE TEST

VIBRATION OUTPUT TEST DATA

½ WATT LINEAR RESONANT CRYOGENIC COOLER

MM&T PROGRAM

Test Plan Paragraph: 4.3.9

Cooler S/N: 016 Total Suspended Weight 4.0 lbs Date: 10/23/86

S/N	Freq.	Force Along Compressor Axis		Force Along Radial Axis				
				(0°) Axis*1		Axis*2		
		g's	lbs	g's	lbs	g's	lbs	
1	54	.171	.484	.332	1.3	.750	1.0	
2	108	.644	2.5	.032	.13	.025	.10	
3	162	.140	.56	.008	.03	.013	.05	
4	216	.061	.24	.004	.02	.005	.02	
5	270	.025		.006		.004		
6	324	.006		.020		.007		
7	378	.009		.004		.008		
8	432	.001		.004		.001		
9	486	.002		.001		.006		
10	540	.002		.003		.004		
11	594					.009		
12	648					.012		
13	702					.014		
14	756					.012		
15	810					.002		

Con't Page 2

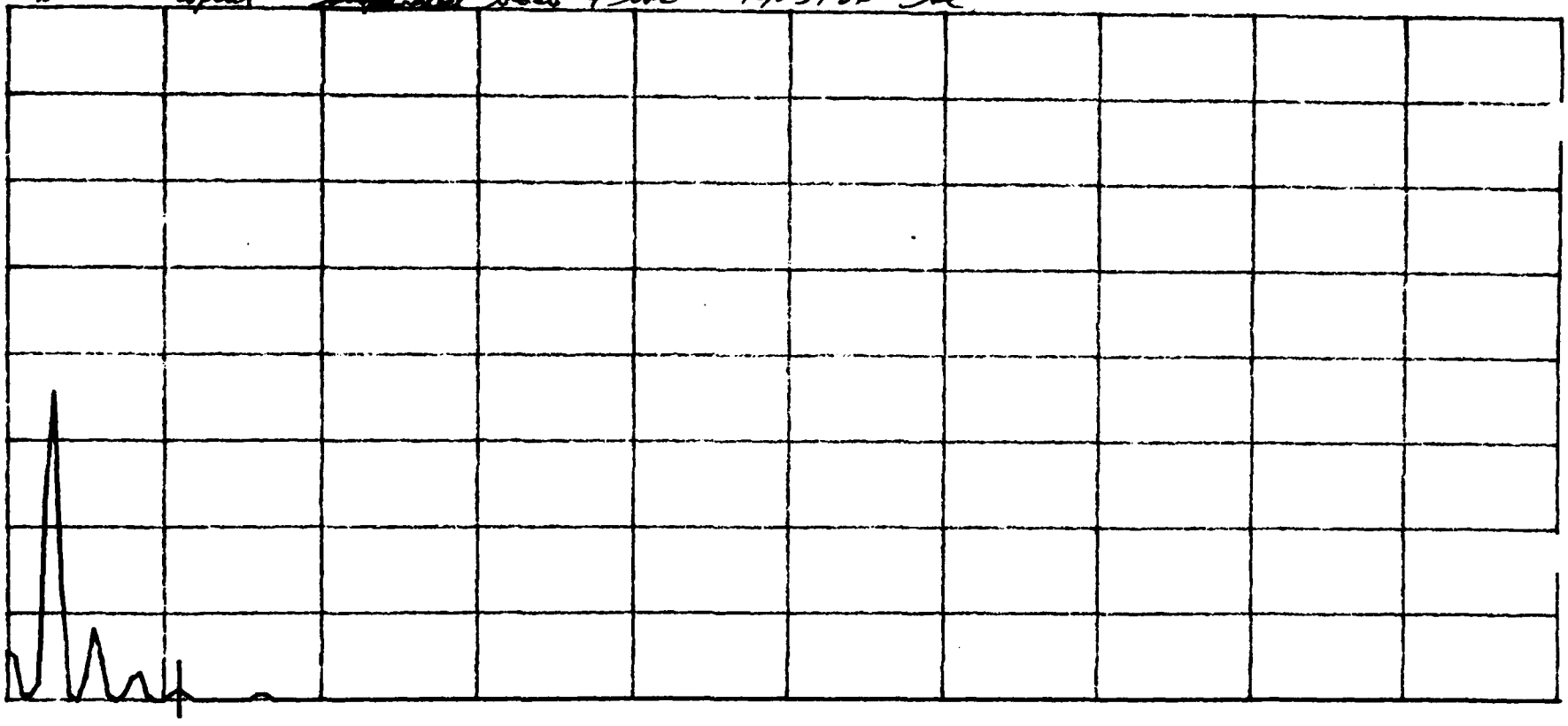
* Axis 1 = along transfer tube
Axis 2 = perpendicular to axis 1

Performed by: S. Campos Date: 10/23/86

Witnessed By: 23 OCT 1986 Customer QA

Magnavox QA

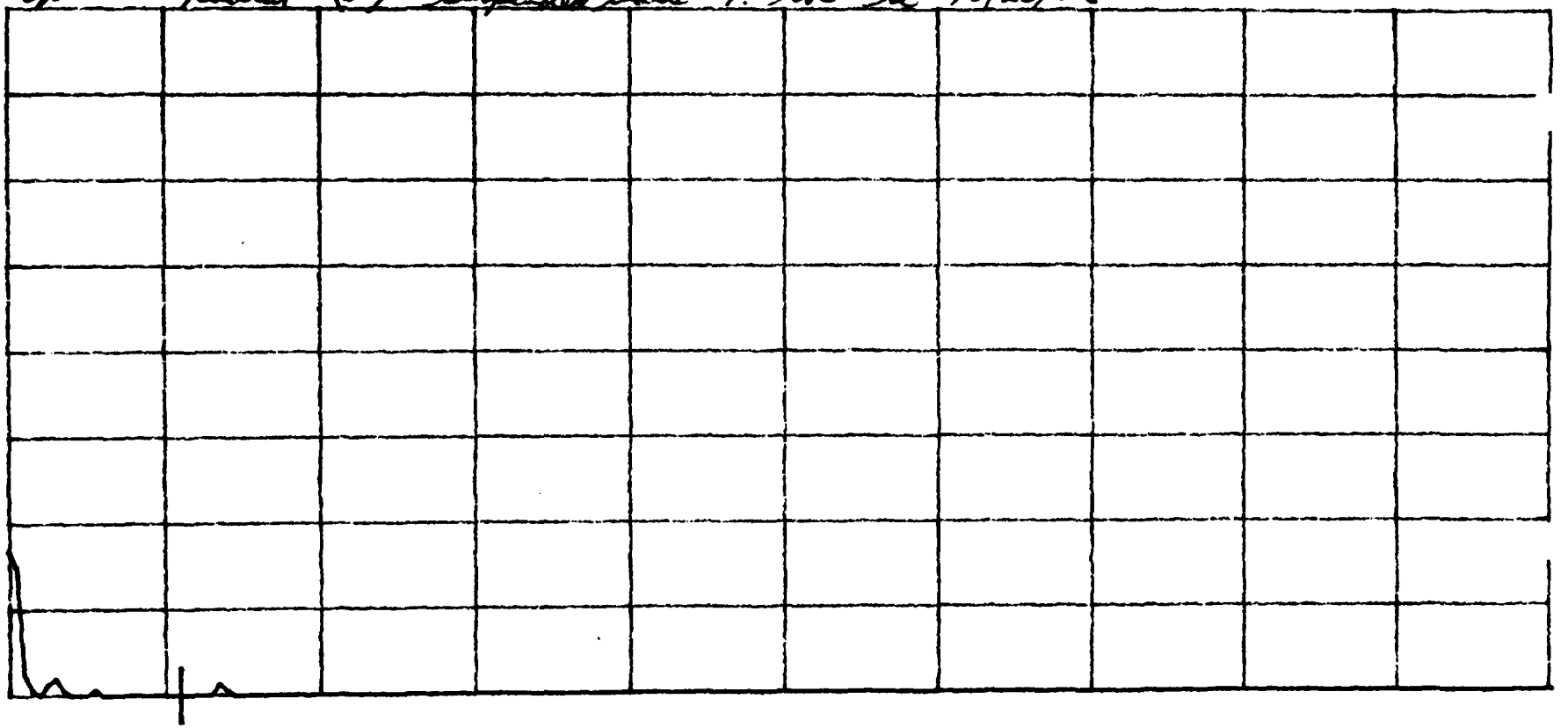
S/N 016 Axial suspended wave 4 lbs 10/23/86 Le



PWR SPECT A : 2.51E-02R 270. HZ N: NONE F: 10HZ

SPAN: 50.00HZ -2.0500KHZ SN: 7.1+00V FS: 1.4+00R 1.8-01R/

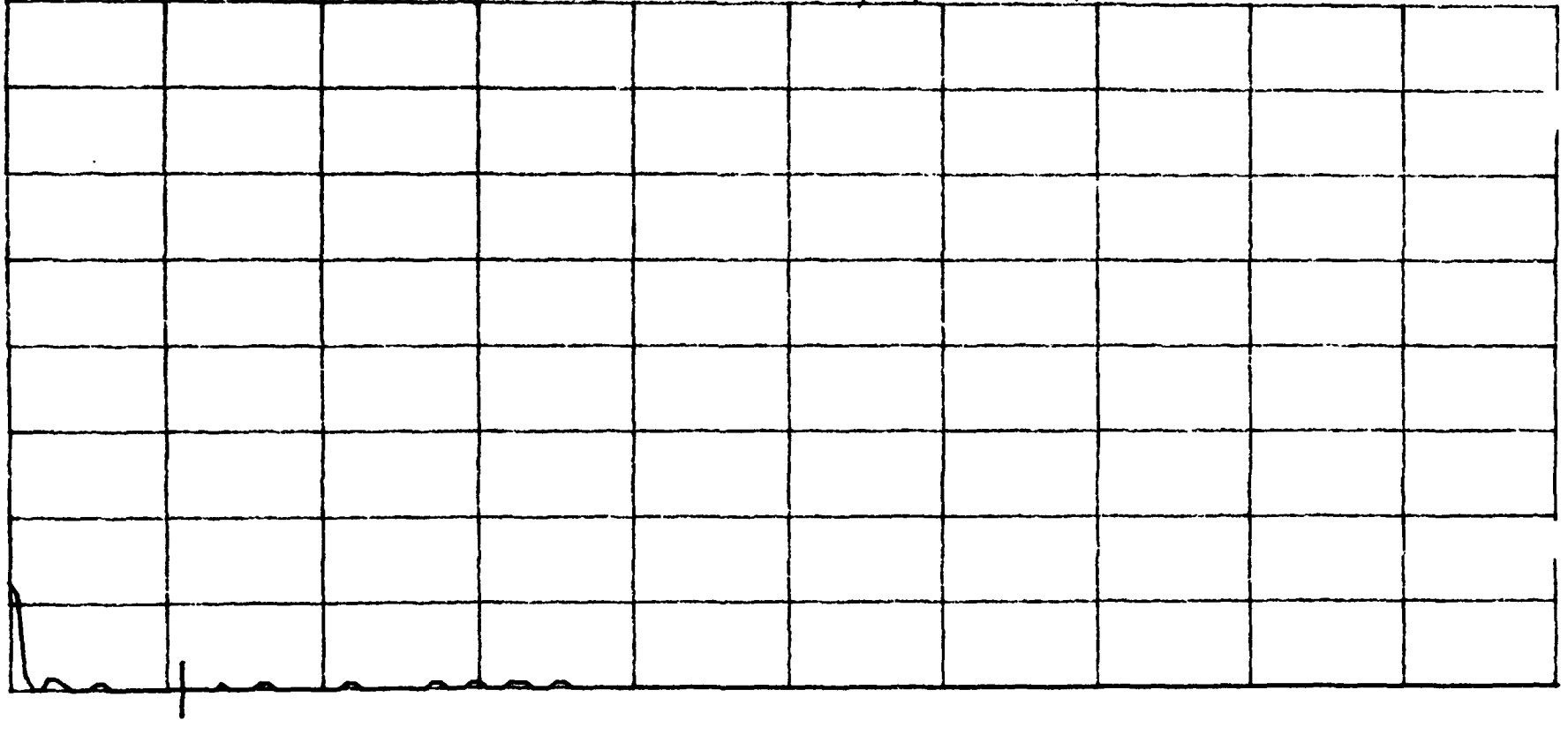
S/N 016 Radial (0°) suspended mass 4. lbs & 10/23/86



PWR SPECT A : 5.11E-03R 270. HZ N: NONE P: 10HZ

SPAN: 50.00HZ -2.0500KHZ SN: 7.1+00V FS: 1.4+00R 1.8-01R/

S/N 016 Radial (90°) suspended mass 4 lbs 10/23/06 Sc.



PWR SPECT A : 4.00E-03R 270. HZ N: NONE P: 10HZ

SPAN: 50.00HZ -2.0500KHZ SN: 7.1+00V FS: 1.4+00R 1.8-01R/

Magnavox
ELECTRO-OPTICAL SYSTEMS
P.O. Box 615, 46 Industrial Avenue, Fountain, N.J. 07439-0615
TEL: 201-889-1700 TWX: 710-989-1672

Contract No. DAAK20-84-C-0440 PERFORMANCE TEST

Project No. 24407 DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC SERIAL NO. 017

DRAWING NO. SM-D-5005842

TEST PLAN PARA	PARAMETER	MEASURED	UNITS	LIMITS MIN	LIMITS MAX
3.10	Calibration Check	COMPLY	-	Comply	
4.1.1	Inspection to SM-D-5005842	COMPLY	-	Comply	
4.1.2	Weight	2.3	Lbs	-	2.5
4.1.3.1	Pressurization	330	PSIG	Info	Only
4.1.3.2	Leakage Rate	6.0×10^{-9}	STP CC/SEC	-	2.7×10^{-7}
4.2.2	Test at 23°C Horiz; Turn-on Current	N/A	Amps	Info	
4.2.2	Cooldown Time to 100°K	4.9	Minutes	-	7.5
4.2.2	Cooldown Time to 80°K	5.6	Minutes	-	10
4.2.2	Minimum Temp	39.0	°K	Info	80
4.2.2.1	Stabl. Temp. with 0.35 Watt Heat Load	66.4	°K		80
4.2.2.2	Temp. after 1/2 Hour Operation	67.6	°K	-	80
4.2.2.3	Cold Finger warm end temp	39	°C	Info	Only
4.2.2.4	Input Volt 17 VDC Current 1.37 ADC Power	23.29	Watts	-	30
4.2.2.5	Stabl. Temp with 0.35 Watt Heat Load	69.2	°K		80
4.2.2.5	Cold Finger Warm End Temp	34	°C	Info	Only
4.2.2.5	Input Volts 32 VDC Current .81 ADC Power	25.92	Watts	-	30
4.2.3	Test at -40°C Horiz; Turn-on Current	N/A	Amps	Info	
4.2.3.1	Cooldown Time to 100°K	4.5	Minutes	-	7.5
4.2.3.1	Cooldown Time to 80°K	5.3	Minutes	-	10
4.2.3.2	Stabl. Temp with 0.2 Watt Heat Load	53.7	°K	-	80
4.2.3.2	Temp after 1/2 Hour	54.3	°K	-	80
4.2.3.3	Cold Finger Warm End Temp	-33	°C	Info	Only
4.2.3.4	Input Volts 17 VDC Current 1.40 ADC Stablized Power	23.80	Watts	-	30
4.2.3.5	Temp with 0.2 Watt Head Load	56.0	°K	-	80
4.2.3.5	Cold Finger Warm End Temp	-32	°C	Info	Only
4.2.3.5	Input Volts 32 VDC Current .81 ADC Power	25.92	Watts	-	30
4.2.4	Test at 71°C Horiz; Turn-on Current	N/A	Amps	Info	
4.2.4.1	Cooldown Time to 100°K	5.6	Minutes	-	7.5
4.2.4.1	Cooldown Time to 80°K	6.7	Minutes	-	10
4.2.4.1	Stabl. Temp. with 0.2 Watt Heat Load	66.6	°K	-	80
4.2.4.1	Temp after 1/2 hour	67.9	°K	-	80
4.2.4.2	Cold Finger Warm End Temp	82	°C	Info	Only
4.2.4.3	Input Volts 17 VDC Current 1.56 ADC Power	26.52	Watts	-	35
4.2.4.4	Stabl. Temp with 0.2 Watt Head Load	69.0	°K	-	80
4.2.4.4	Cold Finger Warm End Temp	82	°C	Info	Only
4.2.4.4	Input Volts 32 VDC Current ADC .91 Power	29.12	Watts	-	35

Performed By: P. HARTMANN Date: 10-29-86

Witnessed By: 31 OCT 1986 Q. A. Magnavox

Witnessed By: DCAS-QAR Q. A. Customer

Magnavox
ELECTRO-OPTICAL SYSTEMS
P.O. [illegible], 46 INDUSTRIAL AVENUE, [illegible], N.J. [illegible]
TEL: [illegible] TWX: [illegible]

Contract: DAAK20-84-C-0440 PERFORMANCE TEST

Project: 24407 DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC SERIAL NO. 017
DRAWING NO. SM-D-5005842

TEST PLAN PARA	PARAMETER	MEASURED	UNITS	LIMITS MIN	LIMITS MAX
4.2.5	Test at 23°C Vertical; Turn-on Current	N/A	Amps	Info	
4.2.5.1	Cooldown Time to 100°K	5.4	Minutes	-	7.5
4.2.5.1	Cooldown Time to 80°K	6.2	Minutes	-	10
4.2.5.1	Minimum Temp	39.2	°K		80
4.2.5.2	Stabl. Temp with 0.35 Watt Heat Load	66.8	°K	-	80
4.2.5.3	Temp After 1/2 Hour With Heat Load	66.9	°K	Info	80
4.2.5.4	Cold Finger Warm End Temp	31	°C	Info	Only
4.2.5.5	Input Volts 17 VDC Current 1.30 ADC Power	22.10	Watts	-	30
4.2.5.6	Stabl. Temp. with 0.35 Watt Heat Load	67.9	°K		80
4.2.5.6	Cold Finger Warm End Temp	35	°C	Info	Only
4.2.5.6	Input Volt 32 VDC Current .78 ADC Power	24.96	Watts	-	30
4.2.6	Leakage Rate	3.4×10^{-9}	STP CC/SEC	-	2.7×10^{-7}

PERFORMED BY P. HARTMANN DATE 10-31-86

WITNESSED BY [signature] Q.A. MAGNAVOX

WITNESSED BY [signature] Q.A. CUSTOMER

31 OCT 1986

Magnavox

ELECTRO-OPTICAL SYSTEMS

P.O. [illegible] 46 INDUSTRIAL AVENUE, JOHNSON, N.J. [illegible]

TEL: [illegible] TWX: [illegible]

PERFORMANCE TEST

VIBRATION OUTPUT TEST DATA

1/4 WATT LINEAR RESONANT CRYOGENIC COOLER

MM & T PROGRAM

DRAWING NO.: SM-D-5005842 SERIAL NO.: 017

CONTRACT : DAAK20-84-C-0440 PROJECT : 24407

Test Plan Para	Frequency	Maximum Force Along Compressor Axis, ± lbs	Measure Force Along Compressor Axis, lbs.	Maximum Force In Any Compressor Radial Axis, ± lbs	Measured Force In Any compressor Radial 0° Axis, lbs.	90°
4.3.9	Fundamental (54 Hz)	1.0	.4715	1.5	.365	1.5
	1st Harmonic (108 Hz)	2.5	2.345	0.22	.0276	.022
	2nd Harmonic (162 Hz)	1.4	.717	0.13	.0210	.041
	3rd Harmonic (216 Hz)	0.30	.241	0.13	.0070	.0047
	Next 37 Harmonics (270 Hz)	0.10	.0934	0.10	.0426	.0512

PERFORMED BY: Dan Matsuura DATE: 10 24 86

WITNESSED BY: 27 OCT 1986 DCAS-OAK 5310/P CUSTOMER Q.A.

MAGNAVOX Q.A.

PERFORMANCE TEST

VIBRATION OUTPUT TEST DATA

½ WATT LINEAR RESONANT CRYOGENIC COOLER

MM&T PROGRAM

Test Plan Paragraph: 4.3.9

Cooler S/N: 017 Total Suspended Weight 4.1 lbs Date: 10-24-86

S/N	Freq.	Force Along Compressor Axis		Force Along Radial Axis				
				Axis*1		Axis*2		
		g's	lbs	g's	lbs	g's	lbs	
1	54	.115	.4715	.0891	.365	.384	1.5	
2	108	.573	2.345	.00674	.0276	.00774	.022	
3	162	.175	.717	.00514	.0210	.0101	.041	
4	216	.0588	.241	.00172	.0070	.00239	.0097	
5	270	.0228	.0934	.00281	.0115	.00173	.0070	
6	324	.00714	.0292	.0104	.0426	.0125	.0512	
7	378	.00336	.0137	.00803	.0329	.00842	.0345	
8	432	.00317	.0129	.00183	.007503	.00224	.0091	
9	486	.00125	.0051	.000717	.0029	.00379	.0155	
10	540	.00346	.0141	.00169	.0069	.00485	.0198	
11	594	.00198	.0081	.00212	.0086	.00124	.0050	
12	648	.000954	.0039	.00204	.0083	.00184	.0075	
13	702	.00392	.0160	.00569	.0233	.00981	.0402	
14	756	.00167	.0068	.00638	.0261	.00784	.0321	
15	810	.00204	.0083	.00111	.0045	.00751	.0307	

Con't Page 2

* Axis 1 = along transfer tube
Axis 2 = perpendicular to axis 1

Performed by: Dan J Matthews Date: 10-24-86

Witnessed By: [signature] B-46 Customer QA

Magnavox QA

PERFORMANCE TEST

VIBRATION OUTPUT TEST DATA

¼ WATT LINEAR RESONANT CRYOGENIC COOLER

MM&T PROGRAM

Test Plan Paragraph: 4.3.9

Cooler S/N: 017 Total Suspended Weight 41 lbs Date: 10-24-86

S/N	Freq.	Force Along Compressor Axis		Force Along Radial Axis				
				Axis*1		Axis*2		
		g's	lbs	g's	lbs	g's	lbs	
16	864	.0127	.05207	.00373	.0152	.000874	.0035	
17	918	.002067	.0084	.00206	.0084	.00199	.0081	
18	972	.00141	.0057	.000832	.0034	.00221	.0090	
19	1026	.00240	.0098	.00230	.00943	.00520	.0213	
20	1080	.00162	.0066	.00363	.0149	.0115	.0471	
21	1134	.00111	.0045	.00295	.0120	.000446	.0020	
22	1188	.00147	.0060	.00153	.0062	.00230	.0094	
23	1242	.000813	.0033	.00443	.0181	.00407	.0166	
24	1296	.00208	.0085	.00191	.0078	.00499	.0204	
25	1350	.00212	.0082	.00175	.0071	.00374	.0153	
26	1404	.000738	.0030	.000824	.0033	.00654	.0026	
27	1458	.000851	.0034	.000992	.0040	.00135	.0055	

Con't Page 3

*Axis 1 = along transfer tube
Axis 2 = perpendicular to axis 1

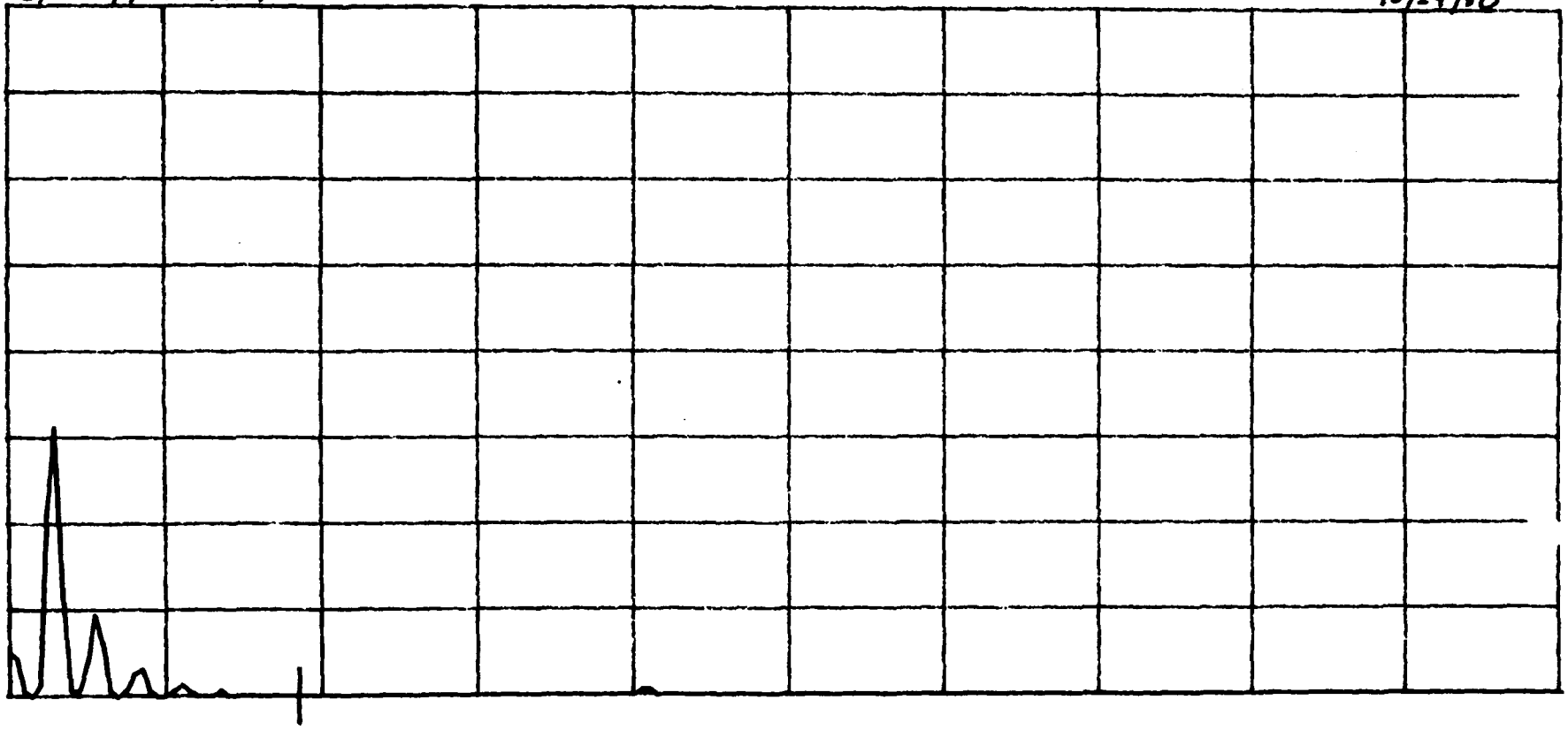
Performed By: David Mathews Data: 10-24-86

Witnessed By: _____ Customer QA

_____ Magnavox QA

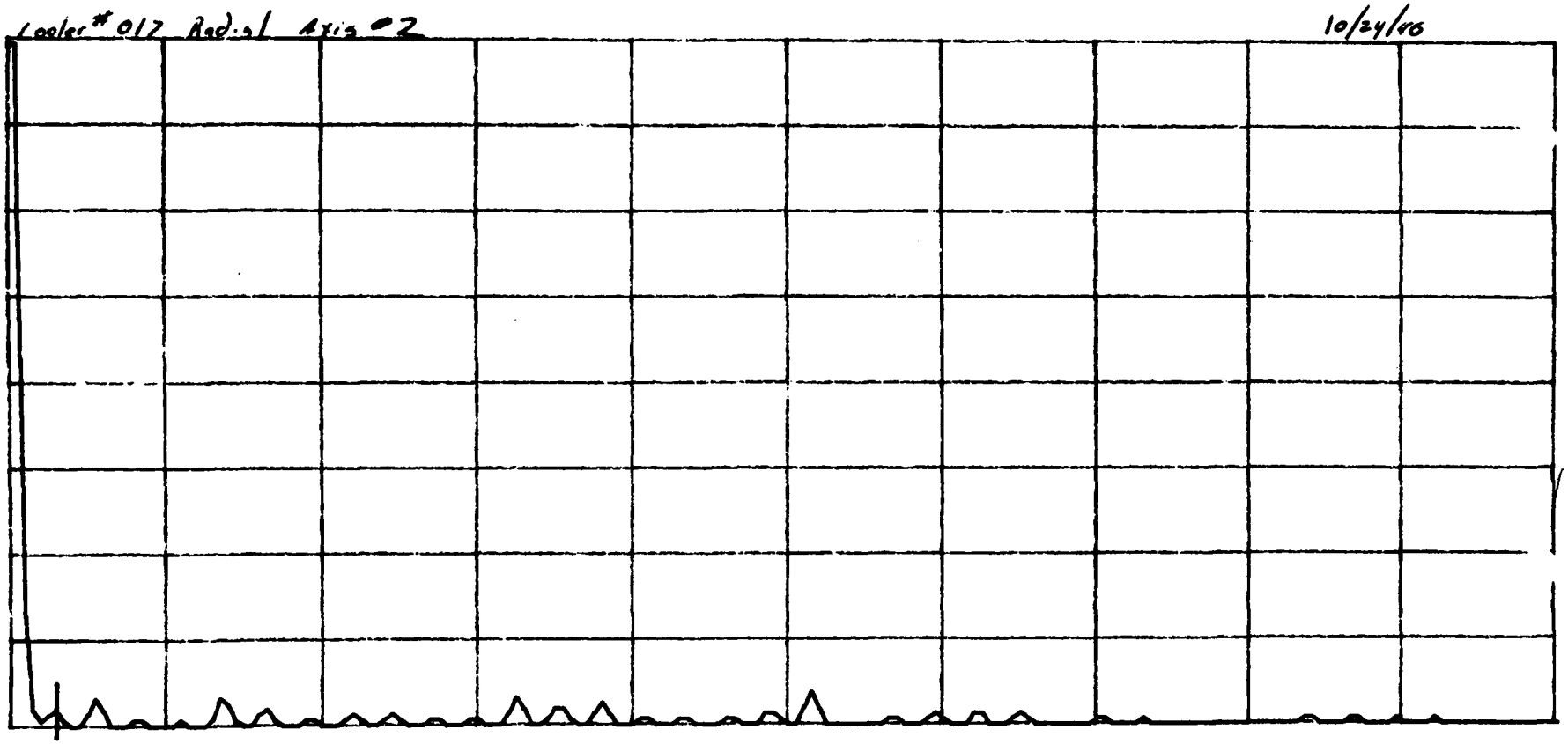
S/N 017 Axial

10/24/86



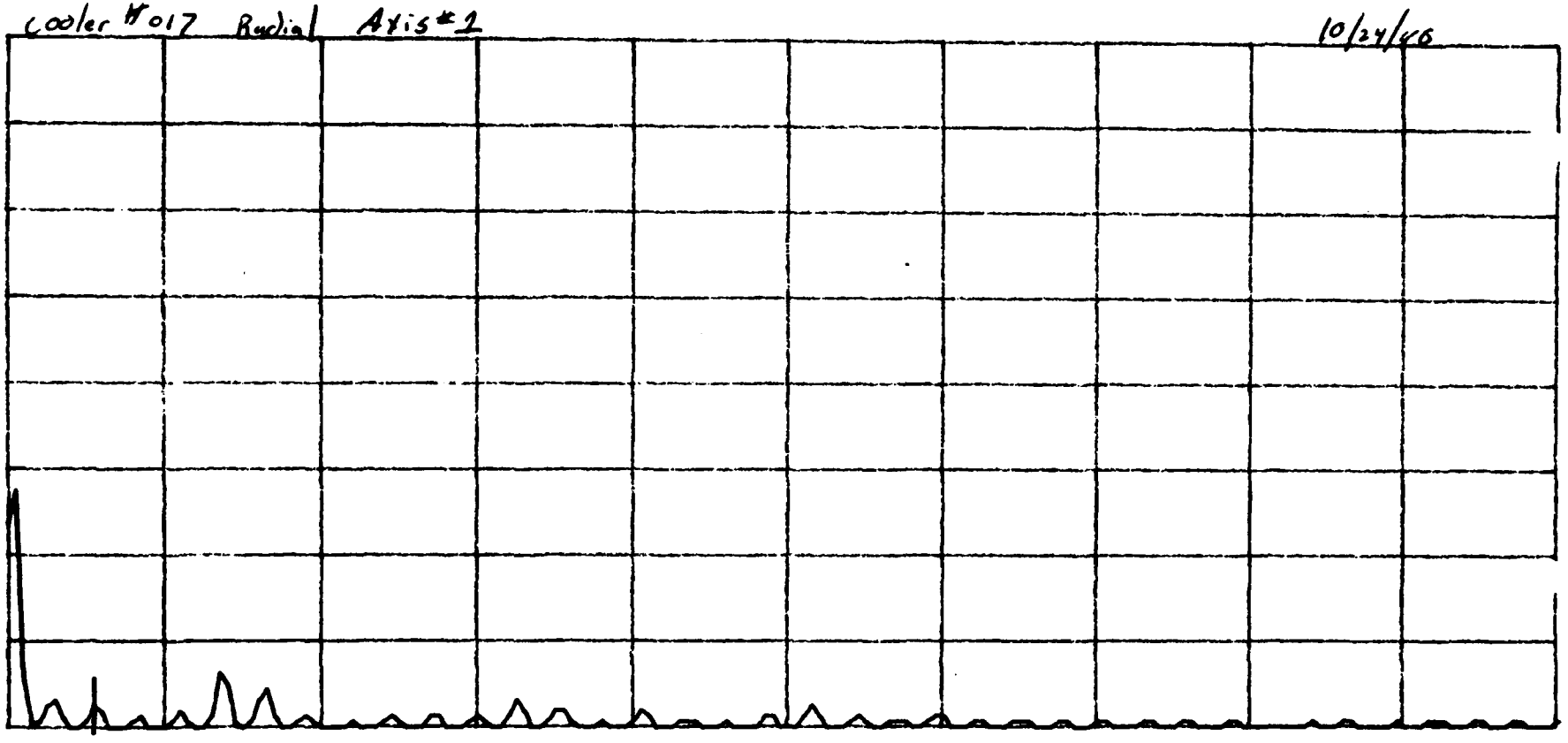
PWR SPECT A : 1.30E-03R 420. HZ N: NONE P: 10HZ

SPAN: 50.00HZ -2.0500KHZ SN: 1.4+00V FS: 1.4+00R 1.8-01R/



PWR SPECT A : 6.53E-03R 110. HZ N: NONE F: 10HZ

SPAN: 50.00HZ -2.0500KHZ SN: 1.4+00V FS: 2.8-01R 3.5-02R/



PWR SPECT A : 4.29E-03R 160. HZ N: NONE P: 10HZ

SPAN: 50.00HZ -2.0500KHZ SN: 1.4+00V FS: 1.4-01R 1.8-02R/

	OCTAVE BAND CENTER FREQUENCY (HZ)						
1/4 WATT LINEAR COOLER: SN	125	250	500	1000	2000	4000	8000
011	16	6	5	7	7	13	22
013	16	6	8	13	11	13	16
015	16	6	20	21	17	18	27
016	22	9	9	6	4	6	13
SPEC MAXIMUM:	37	30	30	25	20	20	20

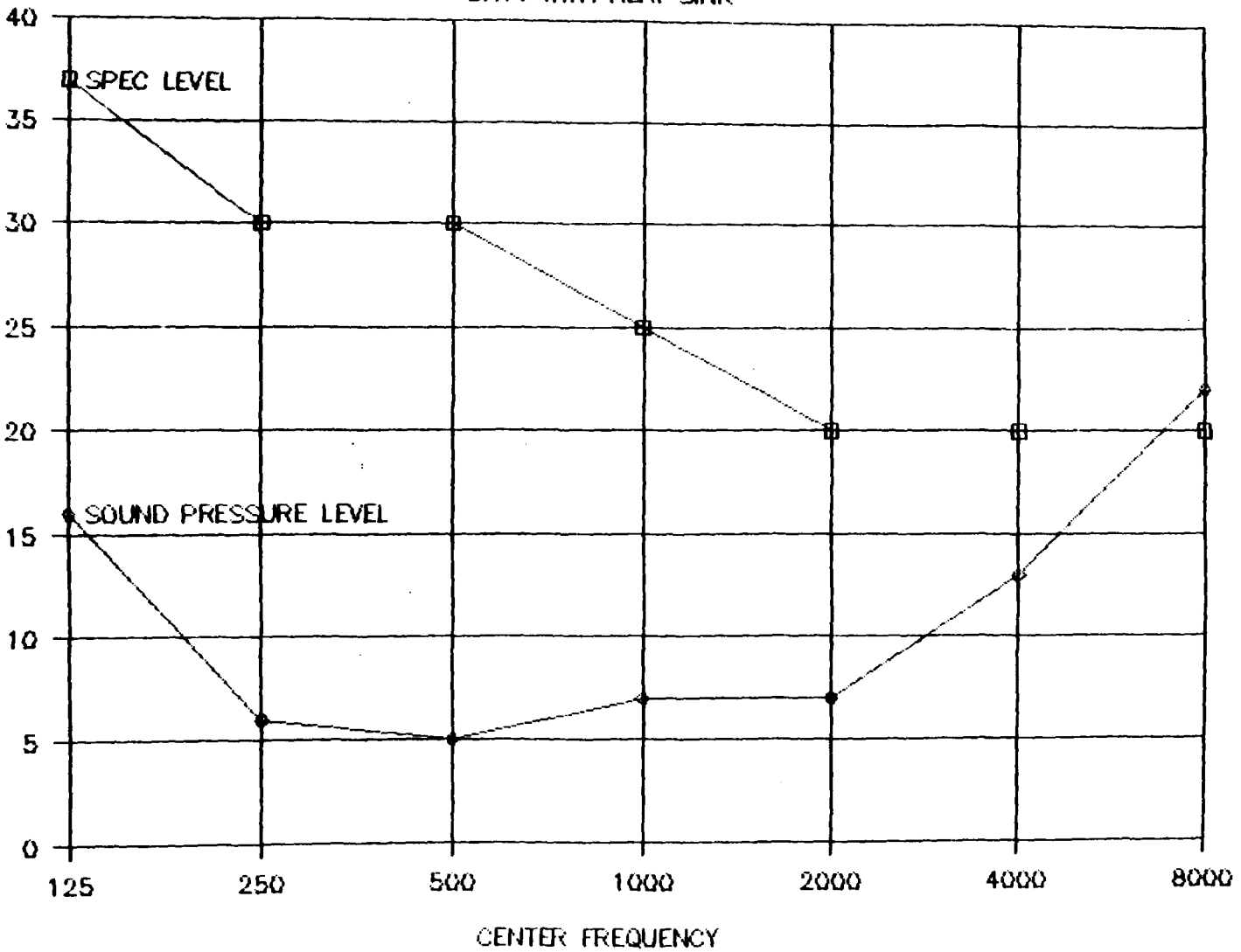
Maximum side, Octave Band Sound Pressure Levels

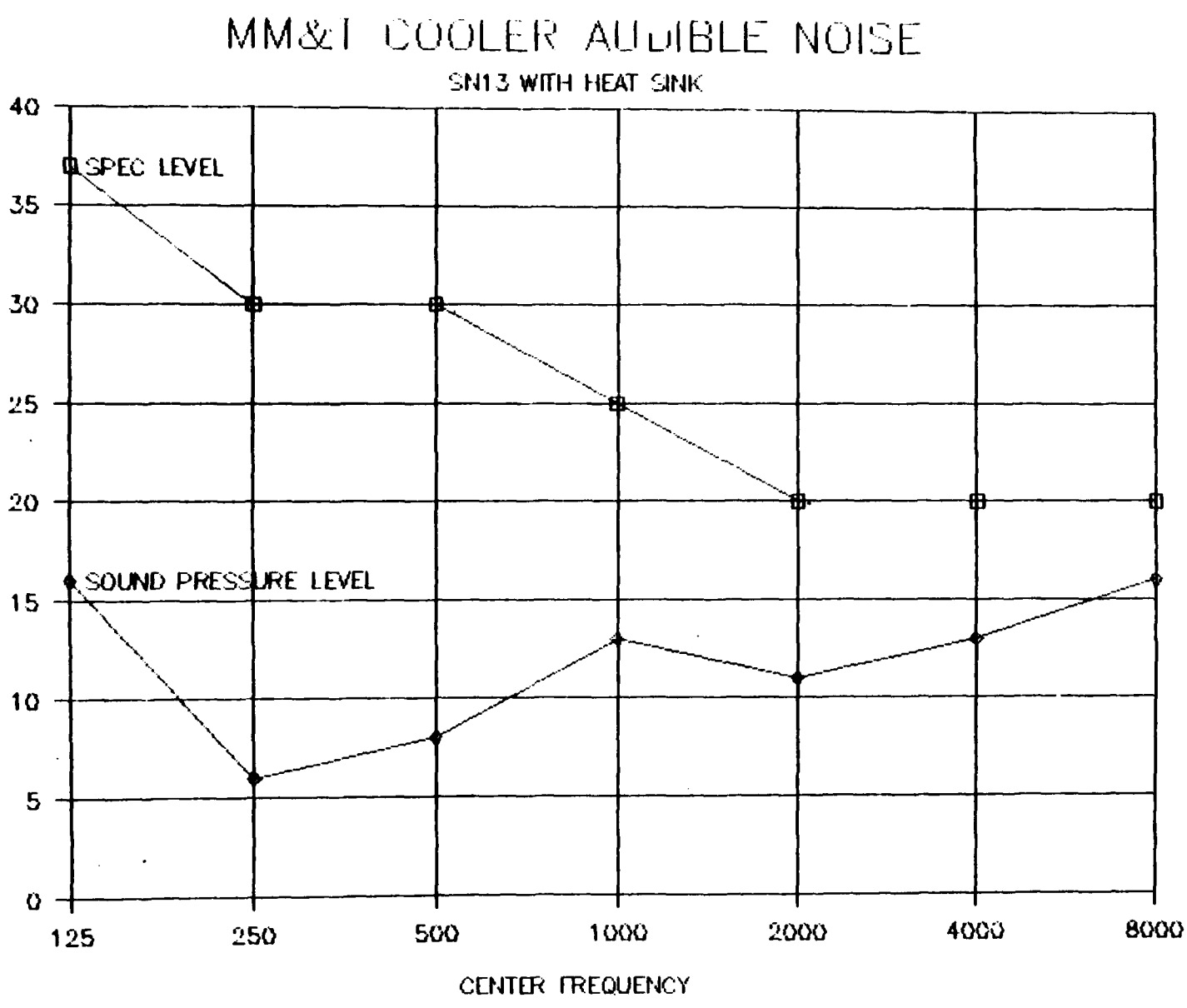
Generated by the 1/4 Watt Linear Cooler (dB re: .0002 uBar)

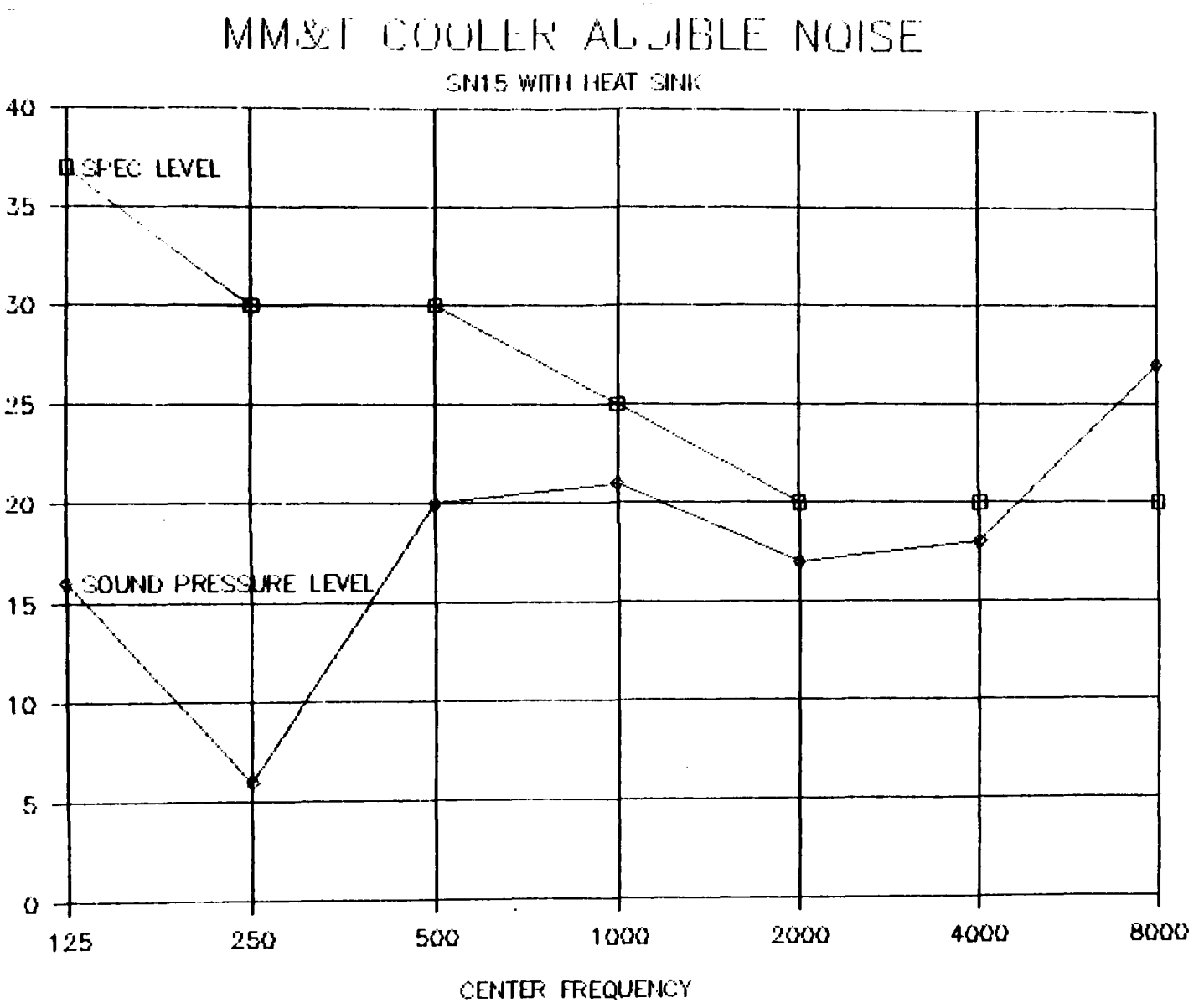
Table 1

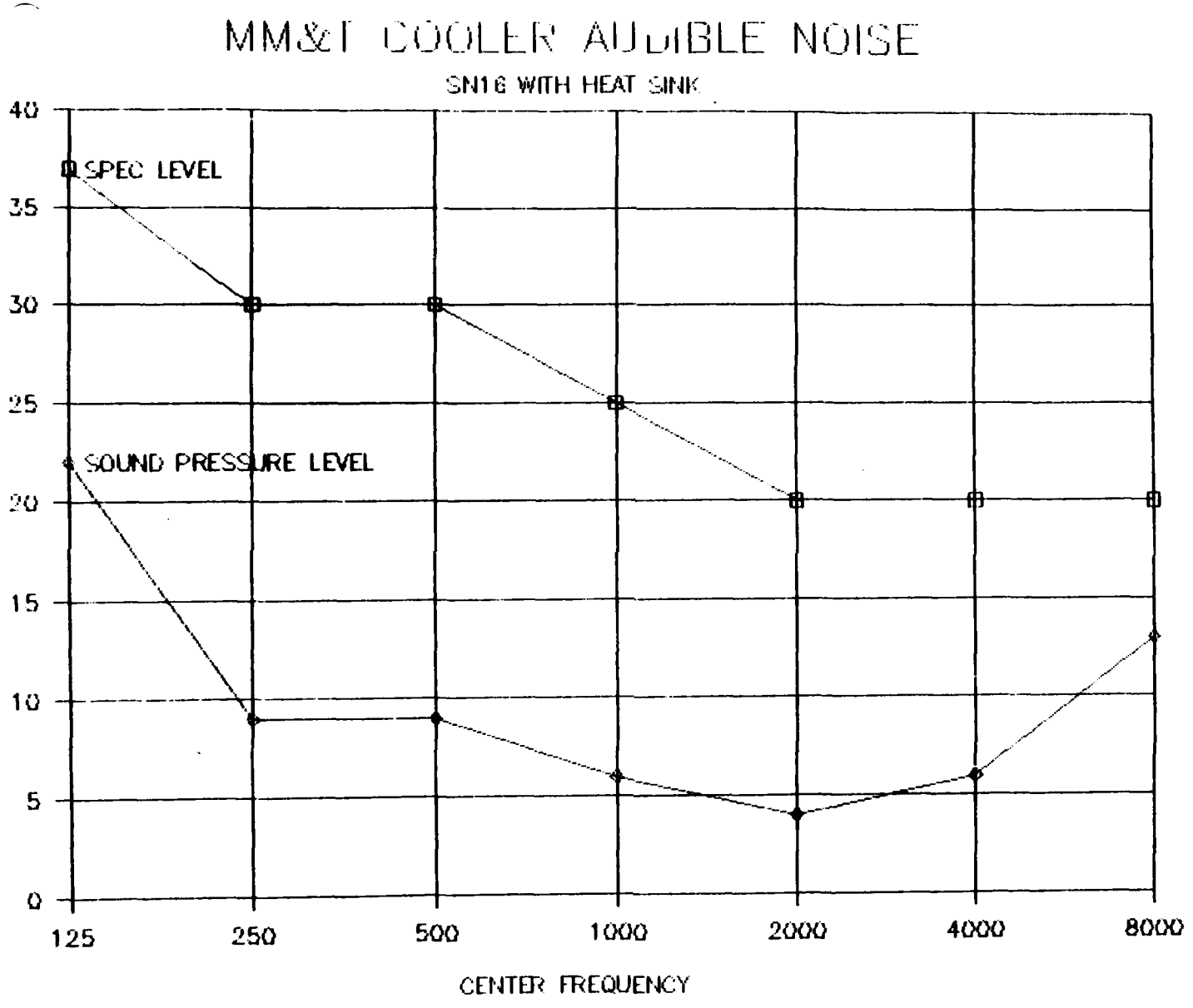
MM&T COOLER AUDIBLE NOISE

SN11 WITH HEAT SINK




MM&T COOLER AUDIBLE NOISE
SN13 WITH HEAT SINK
SPEC LEVEL
SOUND PRESSURE LEVEL
40
35
30
25
20
15
10
5
0
125
250
500
1000
2000
4000
8000
CENTER FREQUENCY


MM&T COOLER AUDIBLE NOISE
SN15 WITH HEAT SINK
SPEC LEVEL
SOUND PRESSURE LEVEL
40
35
30
25
20
15
10
5
0
125
250
500
1000
2000
4000
8000
CENTER FREQUENCY


MM&T COOLER AUDIBLE NOISE
SN16 WITH HEAT SINK
SPEC LEVEL
SOUND PRESSURE LEVEL
40
35
30
25
20
15
10
5
0
125
250
500
1000
2000
4000
8000
CENTER FREQUENCY

NVEOL CRYOGENIC COOLER LAB

CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 18
VOLTAGE: 17.5
AMBIENT: 23°C

DATE: 24 NOV 86 15:43
ENGR: HLD
PROG: CATP+ 1.0

TEST: BASELINE AS RECD FROM MAGIEC

TIME	POWER	CURRENT	KELVIN	LOAD
0.00	16.38	.936	299.67	0.000
1.00	18.58	1.091	244.58	0.000
2.00	19.18	1.181	196.38	0.000
3.00	20.24	1.177	152.81	0.000
4.00	21.53	1.271	113.53	0.000
4.45	22.11	1.263	98.42	0.000
5.00	22.76	1.305	79.84	0.000
5.12	24.39	1.394	76.76	0.000
6.00	24.52	1.441	55.17	0.000
7.00	25.31	1.482	43.45	0.000
8.00	26.14	1.532	38.94	0.000
9.00	26.23	1.520	37.38	0.000
10.00	26.83	1.464	36.73	0.000
11.00	26.96	1.489	36.35	0.000
12.00	27.18	1.577	36.19	0.000
13.00	27.02	1.512	36.23	0.000
14.00	26.75	1.533	36.27	0.000
15.00	27.12	1.553	36.38	0.000
16.00	27.25	1.563	36.46	0.000
17.00	27.28	1.571	36.58	0.000
18.00	26.77	1.531	36.65	0.000
19.00	27.31	1.544	36.73	0.000
20.00	27.29	1.560	36.81	0.000
30.00	24.92	1.407	64.21	.343
40.00	25.11	1.477	64.83	.343

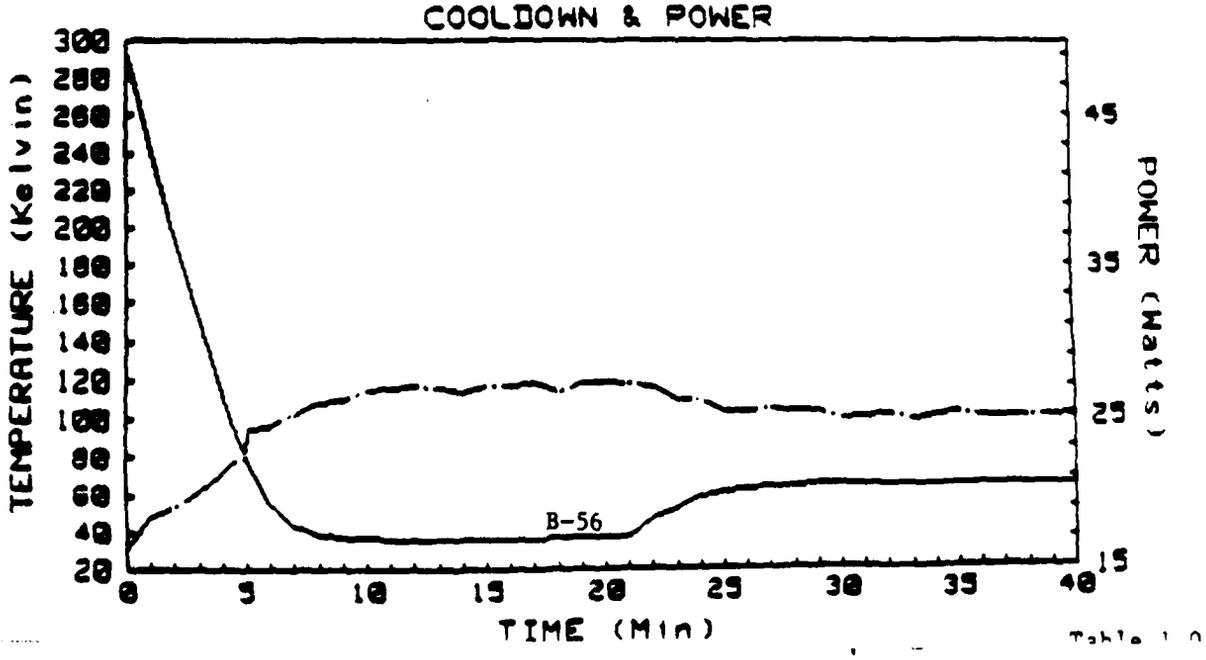


Table 1.01

NVEOL CRYOGENIC COOLER LAB

CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 18
VOLTAGE: 17.5
AMBIENT:

DATE: 24 NOV 86 15:34
ENGR: HLB
PROG: CATP+ 1.0

TEST: BASELINE AS RECD FROM MAGIEC

TIME	POWER	CURRENT	KELVIN	LOAD
0.00	16.38	.936	295.67	0.000
1.00	18.58	1.091	244.58	0.000
2.00	19.18	1.181	196.58	0.000
3.00	20.24	1.177	152.81	0.000
4.00	21.53	1.271	113.53	0.000
4.45	22.11	1.263	98.42	0.000
5.00	22.76	1.305	79.84	0.000
5.12	24.39	1.394	76.76	0.000
6.00	24.52	1.441	55.17	0.000
7.00	25.31	1.482	43.45	0.000
8.00	26.14	1.532	38.94	0.000
9.00	26.23	1.520	37.38	0.000
10.00	26.83	1.464	36.73	0.000
11.00	26.96	1.489	36.35	0.000
12.00	27.18	1.577	36.19	0.000
13.00	27.02	1.512	36.23	0.000
14.00	26.75	1.533	36.27	0.000
15.00	27.12	1.553	36.38	0.000
16.00	27.25	1.563	36.46	0.000
17.00	27.28	1.571	36.58	0.000
18.00	26.77	1.531	36.65	0.000
19.00	27.31	1.544	36.73	0.000
20.00	27.29	1.560	36.81	0.000
21.00	27.16	1.522	36.88	0.000
22.00	27.03	1.522	46.86	.195
23.00	26.16	1.511	52.29	.273
24.00	26.84	1.496	57.89	.343
25.00	25.36	1.420	61.13	.343
26.00	25.36	1.466	62.54	.343
27.00	25.44	1.427	63.33	.343
28.00	25.38	1.458	63.75	.343
29.00	25.26	1.453	64.84	.343
30.00	24.92	1.407	64.21	.343
31.00	24.97	1.433	64.29	.343
32.00	25.13	1.421	64.33	.343
33.00	24.82	1.408	64.46	.343
34.00	25.21	1.418	64.54	.343
35.00	25.36	1.477	64.63	.343
36.00	25.18	1.389	64.63	.343
37.00	25.00	1.484	64.75	.343
38.00	25.09	1.432	64.75	.343
39.00	24.97	1.462	64.79	.343
40.00	25.11	1.477	64.83	.343
41.00	24.93	1.479	64.83	.343

Table I-02

NVEOL CRYOGENIC COOLER LAB

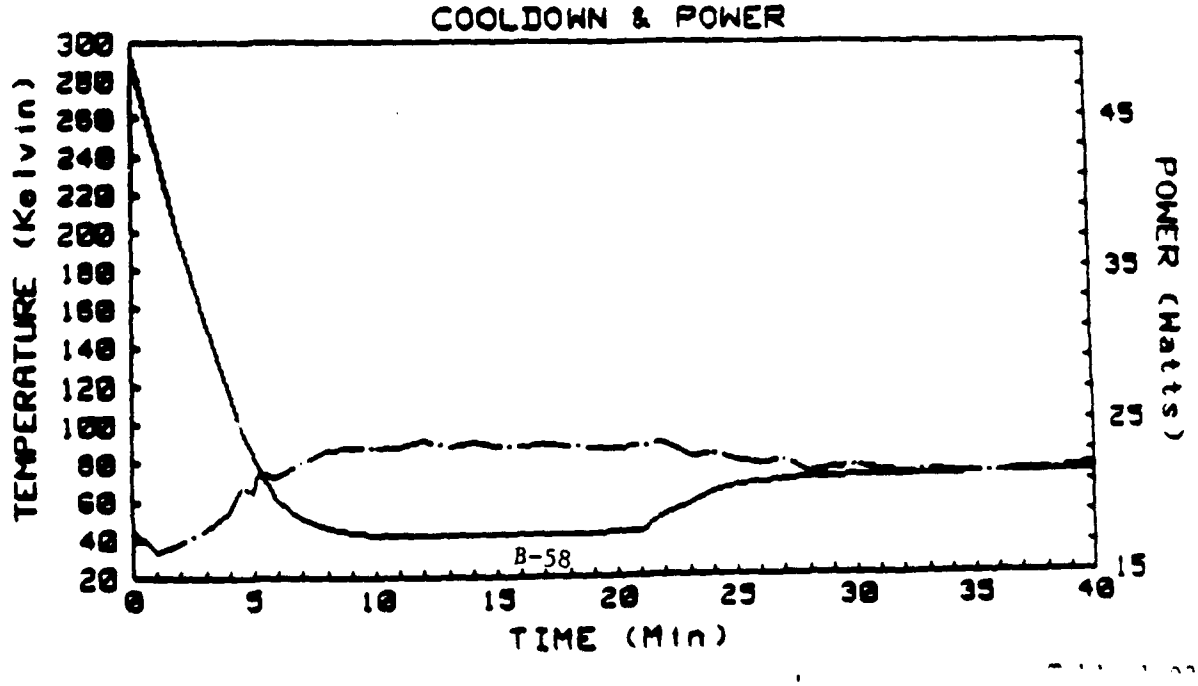
CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 817
VOLTAGE: 17.5
AMBIENT: 23° C

DATE: 24 NOV 86 17:44
ENGR: MAL
PROG: CATP• 1.0

TEST: BASELINE AS RECVD FROM MAGNAVOX

TIME	POWER	CURRENT	KELVIN	LOAD
0.00	18.11	1.035	293.71	0.000
1.00	16.68	.979	245.03	0.000
2.00	17.33	1.032	197.75	0.000
3.00	18.21	1.077	153.72	0.000
4.00	19.32	1.155	116.25	0.000
4.55	20.96	1.198	98.24	0.000
5.00	20.59	1.200	83.71	0.000
5.23	21.74	1.242	77.89	0.000
6.00	21.69	1.265	61.13	0.000
7.00	22.53	1.296	50.46	0.000
8.00	23.29	1.312	45.58	0.000
9.00	23.56	1.381	43.05	0.000
10.00	23.41	1.330	41.73	0.000
11.00	23.51	1.344	41.68	0.000
12.00	23.93	1.360	41.64	0.000
13.00	23.53	1.329	41.64	0.000
14.00	23.80	1.352	41.73	0.000
15.00	23.48	1.320	41.90	0.000
16.00	23.55	1.320	42.00	0.000
17.00	23.59	1.378	42.30	0.000
18.00	23.49	1.331	42.52	0.000
19.00	23.39	1.321	42.70	0.000
20.00	23.37	1.341	42.80	0.000
30.00	22.15	1.265	71.26	.344
40.00	22.14	1.253	73.37	.344



NVEOL CRYOGENIC COOLER LAB

CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 017
VOLTAGE: 17.5
AMBIENT:

DATE: 24 NOV 86 17:44
ENGR: HAL
PROG: CATP+ 1.0

TEST: BASELINE AS RECVD FROM MAGNAVOX

TIME	POWER	CURRENT	KELVIN	LOAD
0.00	18.11	1.035	293.71	0.000
1.00	16.68	.979	245.83	0.000
2.00	17.33	1.032	197.75	0.000
3.00	18.21	1.077	153.72	0.000
4.00	19.32	1.155	116.25	0.000
4.55	20.96	1.190	98.24	0.000
5.00	20.59	1.200	83.71	0.000
5.23	21.74	1.242	77.89	0.000
6.00	21.69	1.265	61.13	0.000
7.00	22.53	1.296	50.46	0.000
8.00	23.29	1.312	45.50	0.000
9.00	23.56	1.301	43.05	0.000
10.00	23.41	1.330	41.73	0.000
11.00	23.51	1.344	41.68	0.000
12.00	23.93	1.368	41.64	0.000
13.00	23.53	1.329	41.64	0.000
14.00	23.80	1.352	41.73	0.000
15.00	23.48	1.320	41.90	0.000
16.00	23.55	1.328	42.00	0.000
17.00	23.59	1.378	42.30	0.000
18.00	23.49	1.331	42.52	0.000
19.00	23.39	1.321	42.70	0.000
20.00	23.37	1.341	42.80	0.000
21.00	23.41	1.327	43.01	0.000
22.00	23.66	1.329	52.00	.195
23.00	22.77	1.325	57.44	.273
24.00	22.79	1.277	63.13	.344
25.00	22.42	1.279	67.81	.344
26.00	22.19	1.229	68.64	.344
27.00	22.37	1.252	69.69	.344
28.00	21.67	1.217	70.37	.344
29.00	21.99	1.275	70.83	.344
30.00	22.15	1.265	71.26	.344
31.00	21.81	1.247	71.54	.344
32.00	21.68	1.217	71.73	.344
33.00	21.78	1.275	72.00	.344
34.00	21.64	1.216	72.24	.344
35.00	21.68	1.270	72.47	.344
36.00	21.70	1.242	72.71	.344
37.00	21.71	1.255	72.94	.344
38.00	21.84	1.217	73.18	.344
39.00	21.90	1.264	73.29	.344
40.00	22.14	1.253	73.37	.344
41.00	21.45	1.240	73.53	.344

NVEOL CRYOGENIC COOLER LAB

CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 010
VOLTAGE: 17.5
AMBIENT:

DATE: 26 NOV 86 12:40
ENGR: HAL
PROG: CATP+ 1.0

TEST: Post temperature SHOCK Baseline

TIME	POWER	CURRENT	KELVIN	LOAD
0.00	20.26	1.150	301.25	0.000
1.00	18.47	1.102	249.04	0.000
2.00	19.20	1.125	201.15	0.000
3.00	20.23	1.173	156.94	0.000
4.00	21.34	1.242	116.96	0.000
4.55	23.02	1.316	97.60	0.000
5.00	22.80	1.339	82.07	0.000
5.12	23.47	1.341	78.75	0.000
6.00	24.31	1.450	55.74	0.000
7.00	26.16	1.542	42.61	0.000
8.00	26.92	1.565	37.00	0.000
9.00	26.87	1.586	36.00	0.000
10.00	27.21	1.552	35.12	0.000
11.00	27.42	1.547	34.73	0.000
12.00	27.71	1.625	34.62	0.000
13.00	27.31	1.552	34.58	0.000
14.00	27.30	1.543	34.54	0.000
15.00	27.74	1.635	34.54	0.000
16.00	27.57	1.585	34.54	0.000
17.00	27.37	1.588	34.54	0.000
18.00	27.74	1.569	34.58	0.000
19.00	27.58	1.563	34.62	0.000
20.00	27.97	1.610	34.58	0.000
30.00	26.27	1.499	68.46	.363
40.00	25.86	1.439	68.67	.363

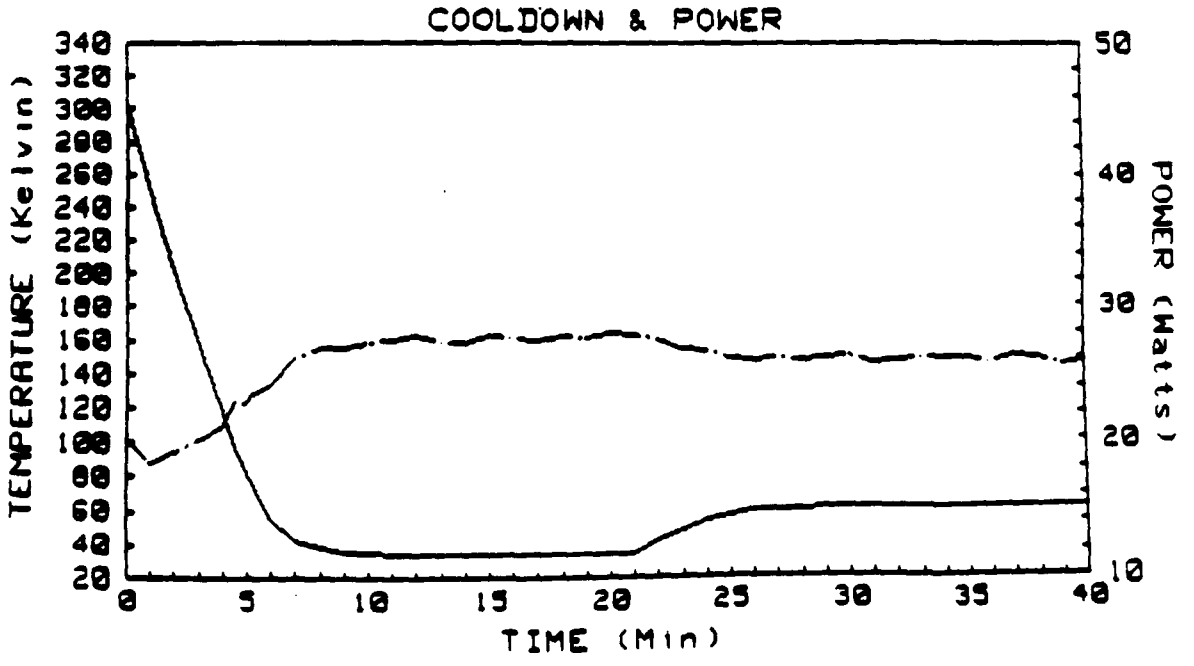


Table [illegible].3

NVEOL CRYOGENIC COOLER LAB

CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 810
VOLTAGE: 17.5
AMBIENT:

DATE: 26 NOV 86 12:48
ENGR: HAL
PROG: CATP+ 1.0

TEST: Post temperature SHOCK Baseline

TIME	POWER	CURRENT	KELVIN	LOAD
0.00	20.26	1.150	301.25	0.000
1.00	18.47	1.102	249.04	0.000
2.00	19.20	1.125	201.15	0.000
3.00	20.23	1.173	156.94	0.000
4.00	21.34	1.242	116.96	0.000
4.55	23.02	1.316	97.60	0.000
5.00	22.80	1.339	82.07	0.000
5.12	23.47	1.341	78.75	0.000
6.00	24.31	1.450	55.74	0.000
7.00	26.16	1.542	42.61	0.000
8.00	26.92	1.565	37.80	0.000
9.00	26.87	1.586	36.00	0.000
10.00	27.21	1.552	35.12	0.000
11.00	27.42	1.547	34.73	0.000
12.00	27.71	1.625	34.62	0.000
13.00	27.31	1.552	34.58	0.000
14.00	27.38	1.543	34.54	0.000
15.00	27.74	1.635	34.54	0.000
16.00	27.57	1.585	34.54	0.000
17.00	27.37	1.588	34.54	0.000
18.00	27.74	1.569	34.58	0.000
19.00	27.58	1.563	34.62	0.000
20.00	27.97	1.610	34.58	0.000
21.00	27.86	1.587	34.62	0.000
22.00	27.42	1.513	43.18	.195
23.00	26.80	1.513	48.23	.256
24.00	26.55	1.495	53.21	.325
25.00	26.18	1.452	57.15	.363
26.00	25.81	1.497	58.84	.363
27.00	25.96	1.462	59.67	.363
28.00	25.98	1.488	60.04	.363
29.00	26.18	1.537	60.29	.363
30.00	26.27	1.499	60.46	.363
31.00	25.61	1.459	60.58	.363
32.00	25.92	1.523	60.63	.363
33.00	25.99	1.500	60.63	.363
34.00	26.02	1.497	60.58	.363
35.00	26.02	1.521	60.63	.363
36.00	25.76	1.499	60.58	.363
37.00	26.25	1.504	60.58	.363
38.00	26.04	1.443	60.67	.363
39.00	25.59	1.443	60.67	.363
40.00	25.86	1.439	60.67	.363
41.00	25.81	1.492	60.63	.363

NVEOL CRYOGENIC COOLER LAB

CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 017
VOLTAGE: 17.5
AMBIENT:

DATE: 26 NOV 86 11:34
ENGR: HAL
PROG: CATP+ 1.8

TEST: Post temperature SHOCK Baseline

TIME	POWER	CURRENT	KELVIN	LOAD
0.00	16.68	.953	300.40	0.000
1.00	16.39	.983	253.31	0.000
2.00	17.08	1.001	204.20	0.000
3.00	17.96	1.083	159.67	0.000
4.00	19.30	1.130	119.95	0.000
4.65	20.41	1.166	97.45	0.000
5.00	20.45	1.220	86.40	0.000
5.33	21.53	1.230	77.27	0.000
6.00	21.95	1.300	61.30	0.000
7.00	22.81	1.321	48.54	0.000
8.00	23.37	1.320	43.45	0.000
9.00	23.96	1.376	41.11	0.000
10.00	23.62	1.345	40.09	0.000
11.00	24.00	1.354	39.69	0.000
12.00	23.84	1.329	39.56	0.000
13.00	24.14	1.397	39.60	0.000
14.00	23.97	1.405	39.70	0.000
15.00	24.18	1.408	39.96	0.000
16.00	23.81	1.327	40.10	0.000
17.00	23.93	1.333	40.35	0.000
18.00	23.95	1.364	40.44	0.000
19.00	23.78	1.389	40.62	0.000
20.00	23.86	1.338	40.71	0.000
30.00	22.27	1.284	66.86	.344
40.00	22.84	1.281	67.94	.344

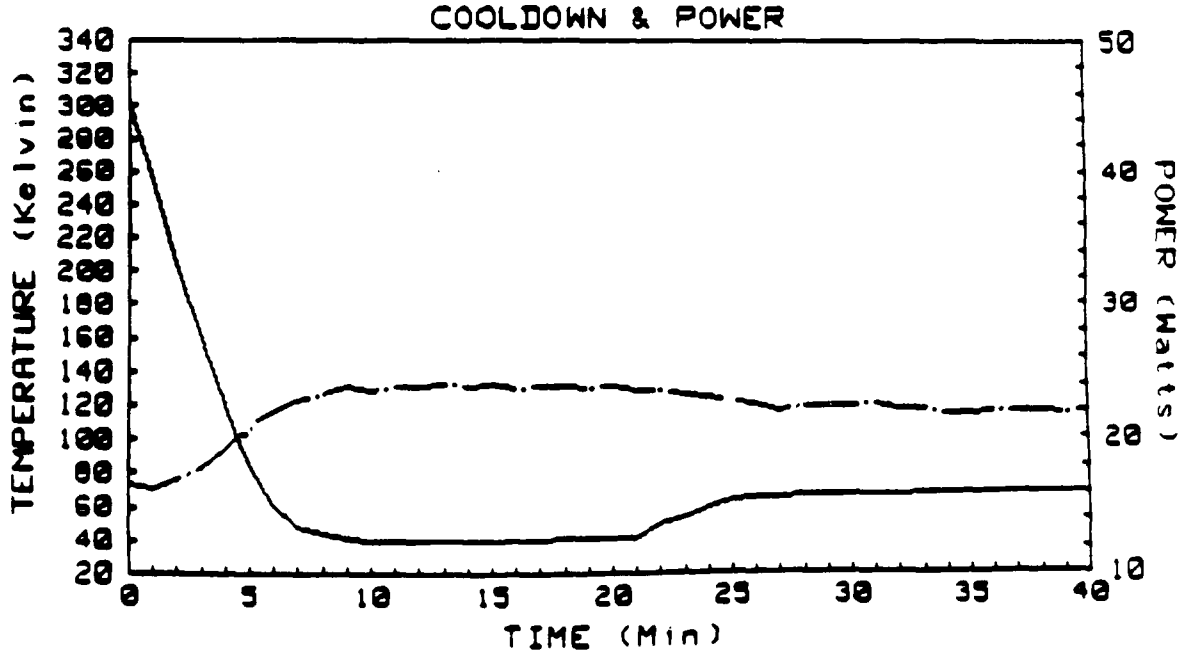


Table 1.1.5

NVEOL CRYOGENIC COOLER LAB

CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 817
VOLTAGE: 17.5
AMBIENT:

DATE: 26 NOV 86 11:35
ENGR: HAL
PROG: CATP* 1.0

TEST: Post temperature SHOCK Baseline

TIME	POWER	CURRENT	KELVIN	LOAD
0.00	16.60	.953	300.48	0.000
1.00	16.39	.983	253.31	0.000
2.00	17.00	1.001	204.20	0.000
3.00	17.96	1.083	159.67	0.000
4.00	19.30	1.138	119.95	0.000
4.65	20.41	1.166	97.45	0.000
5.00	20.45	1.228	86.40	0.000
5.33	21.53	1.238	77.27	0.000
6.00	21.95	1.300	61.30	0.000
7.00	22.81	1.321	48.54	0.000
8.00	23.37	1.320	43.45	0.000
9.00	23.96	1.376	41.11	0.000
10.00	23.62	1.345	40.09	0.000
11.00	24.00	1.354	39.69	0.000
12.00	23.84	1.329	39.56	0.000
13.00	24.14	1.397	39.60	0.000
14.00	23.97	1.405	39.78	0.000
15.00	24.18	1.400	39.96	0.000
16.00	23.81	1.327	40.18	0.000
17.00	23.93	1.333	40.35	0.000
18.00	23.95	1.364	40.44	0.000
19.00	23.78	1.389	40.62	0.000
20.00	23.86	1.338	40.71	0.000
21.00	23.51	1.341	40.88	0.000
22.00	23.62	1.326	49.47	.196
23.00	23.24	1.360	54.25	.257
24.00	22.97	1.314	59.58	.363
25.00	22.65	1.260	63.25	.363
26.00	22.52	1.293	65.46	.344
27.00	22.85	1.279	65.81	.344
28.00	22.29	1.307	66.23	.344
29.00	22.30	1.275	66.66	.344
30.00	22.27	1.284	66.86	.344
31.00	22.45	1.288	66.93	.344
32.00	22.11	1.294	67.20	.344
33.00	22.24	1.309	67.36	.344
34.00	21.86	1.245	67.48	.344
35.00	21.89	1.224	67.52	.344
36.00	22.07	1.258	67.71	.344
37.00	21.93	1.282	67.79	.344
38.00	21.98	1.285	67.90	.344
39.00	21.79	1.234	67.98	.344
40.00	22.04	1.281	67.94	.344
41.00	22.03	1.266	67.98	.344

Table 4.4.6

NVEOL CRYOGENIC COOLER LAB

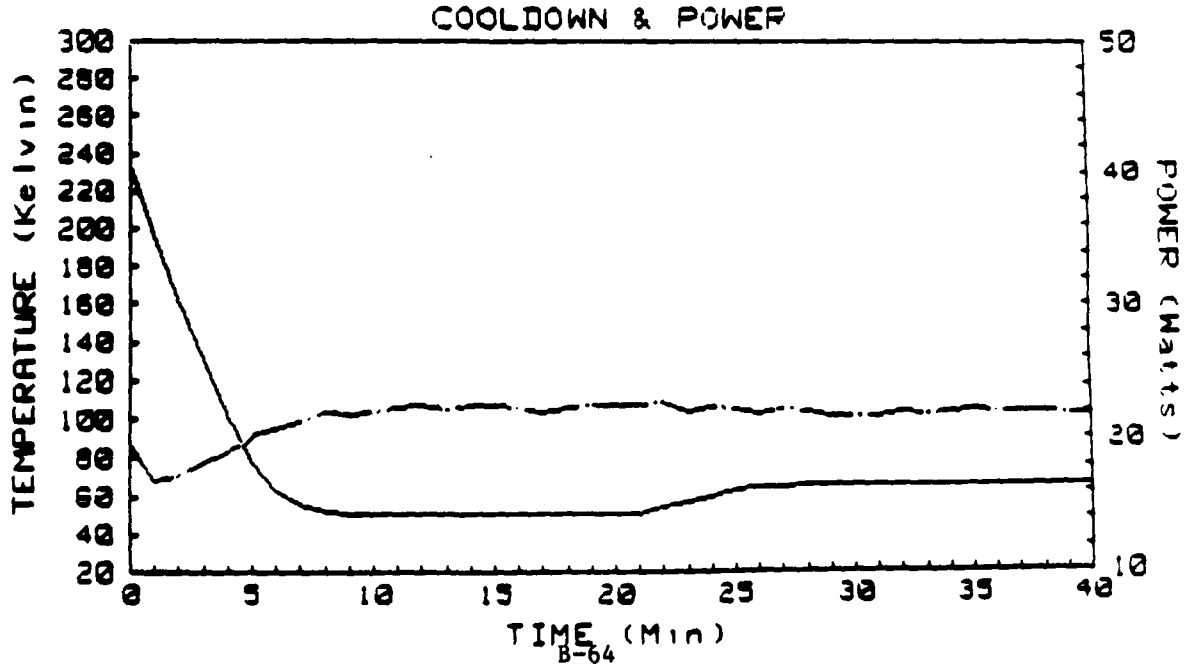
CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 010
VOLTAGE: 17.5
AMBIENT:

DATE: 9 DEC 86 15:01
ENGR: HLD
PROG: CATP* 1.0

TEST: LOW TEMPERATURE PERFORMANCE TEST

TIME	POWER	CURRENT	KELVIN	LOAD
0.00	19.54	1.116	233.00	0.000
1.00	16.89	.972	196.80	0.000
2.00	17.29	.950	162.50	0.000
3.00	18.36	1.052	131.20	0.000
4.00	19.05	1.119	103.10	0.000
4.23	19.38	1.100	97.40	0.000
5.00	19.90	1.150	79.23	0.000
5.13	20.45	1.160	77.00	0.000
6.00	20.82	1.199	63.15	0.000
7.00	21.35	1.261	55.60	0.000
8.00	21.95	1.294	52.64	0.000
9.00	21.88	1.265	51.86	0.000
10.00	21.97	1.274	50.58	0.000
11.00	22.29	1.264	50.36	0.000
12.00	22.43	1.276	50.23	0.000
13.00	22.23	1.307	50.32	0.000
14.00	22.47	1.317	50.32	0.000
15.00	22.43	1.296	50.41	0.000
16.00	22.26	1.247	50.36	0.000
17.00	21.93	1.270	50.45	0.000
18.00	22.34	1.314	50.45	0.000
19.00	22.45	1.296	50.36	0.000
20.00	22.58	1.294	50.45	0.000
30.00	21.66	1.282	65.61	.193
40.00	21.89	1.269	65.85	.193



NVEOL CRYOGENIC COOLER DATA

CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 018
VOLTAGE: 17.5
AMBIENT:

DATE: 9 DEC 86 15:00
ENGR: HLD
PROG: CATP* 1.0

TEST: LOW TEMPERATURE PERFORMANCE TEST

TIME	POWER	CURRENT	KELVIN	LOAD
0.00	19.94	1.116	233.00	0.000
1.00	16.89	.972	196.00	0.000
2.00	17.29	.950	162.50	0.000
3.00	18.16	1.052	131.20	0.000
4.00	19.05	1.119	103.10	0.000
4.23	19.30	1.108	97.40	0.000
5.00	19.90	1.150	79.23	0.000
5.13	20.45	1.160	77.00	0.000
6.00	20.82	1.199	63.15	0.000
7.00	21.35	1.261	55.60	0.000
8.00	21.95	1.294	52.64	0.000
9.00	21.80	1.265	51.06	0.000
10.00	21.97	1.274	50.50	0.000
11.00	22.29	1.264	50.36	0.000
12.00	22.43	1.276	50.23	0.000
13.00	22.23	1.307	50.32	0.000
14.00	22.47	1.317	50.32	0.000
15.00	22.43	1.296	50.41	0.000
16.00	22.26	1.247	50.36	0.000
17.00	21.93	1.270	50.45	0.000
18.00	22.34	1.314	50.45	0.000
19.00	22.45	1.296	50.36	0.000
20.00	22.58	1.294	50.45	0.000
21.00	22.54	1.293	50.49	0.000
22.00	22.60	1.307	54.84	.078
23.00	21.93	1.293	56.91	.118
24.00	22.30	1.265	60.84	.167
25.00	22.12	1.283	63.19	.193
26.00	21.79	1.233	64.46	.193
27.00	22.17	1.249	64.99	.193
28.00	22.02	1.268	65.16	.193
29.00	21.72	1.267	65.48	.193
30.00	21.66	1.282	65.61	.193
31.00	21.68	1.288	65.65	.193
32.00	21.93	1.263	65.69	.193
33.00	21.73	1.217	65.69	.193
34.00	21.92	1.287	65.73	.193
35.00	22.16	1.271	65.57	.193
36.00	21.92	1.252	65.73	.193
37.00	21.92	1.262	65.73	.193
38.00	21.92	1.214	65.81	.193
39.00	21.82	1.247	65.85	.193
40.00	21.89	1.269	65.85	.193
41.00	21.87	1.251	66.30	.193

NVEOL CRYOGENIC COOLER LAB

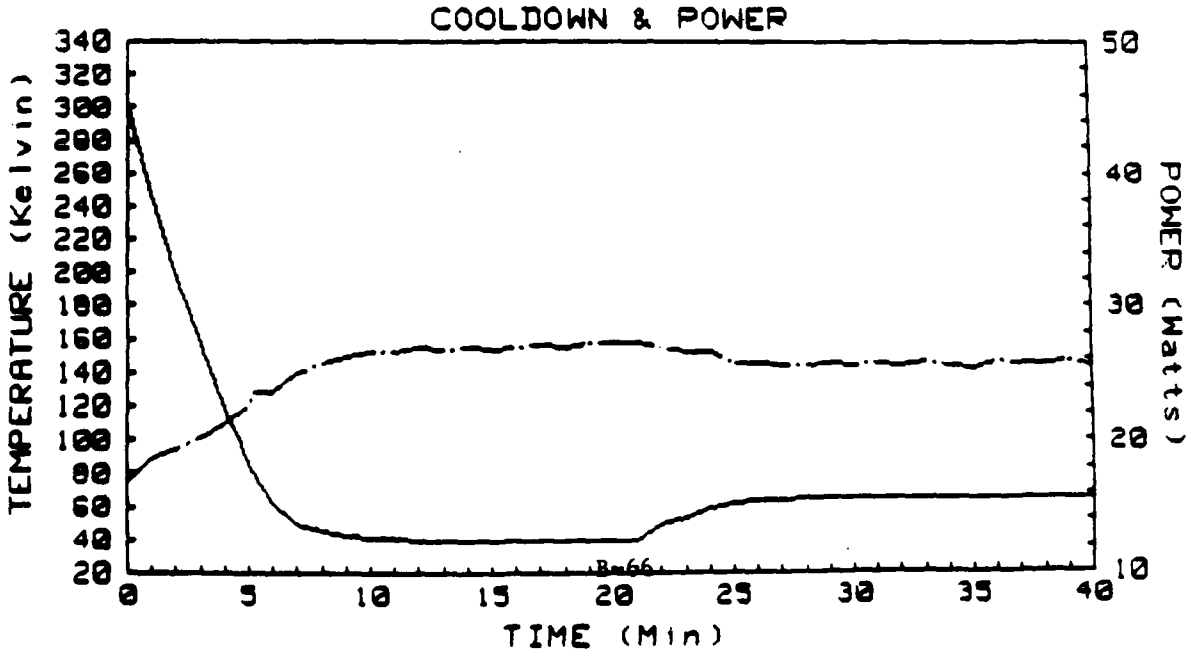
CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 810
VOLTAGE: 17.5
AMBIENT:

DATE: 10 DEC 1986 11:01
ENGR: H K
PROG: CATP* 1.0

TEST: POST LOW TEMP. PERFORMANCE TEST < 24 DEG. C >

TIME	POWER	CURRENT	KELVIN	LOAD
0.00	16.85	.963	300.34	0.000
1.00	18.63	1.070	247.64	0.000
2.00	19.37	1.101	200.00	0.000
3.00	20.25	1.153	157.10	0.000
4.00	21.20	1.215	118.64	0.000
4.67	22.16	1.266	96.89	0.000
5.00	22.50	1.310	86.04	0.000
5.23	23.49	1.342	80.00	0.000
6.00	23.65	1.398	62.04	0.000
7.00	25.00	1.486	49.75	0.000
8.00	25.70	1.503	44.70	0.000
9.00	26.25	1.499	42.56	0.000
10.00	26.60	1.478	41.56	0.000
11.00	26.54	1.544	40.91	0.000
12.00	26.94	1.516	40.25	0.000
13.00	26.73	1.547	40.30	0.000
14.00	26.91	1.537	40.15	0.000
15.00	26.77	1.570	40.07	0.000
16.00	26.96	1.589	40.15	0.000
17.00	27.12	1.555	40.00	0.000
18.00	26.94	1.533	40.15	0.000
19.00	27.20	1.519	40.15	0.000
20.00	27.32	1.558	40.11	0.000
30.00	25.58	1.499	65.03	.344
40.00	25.52	1.464	64.87	.343



NVEOL CRYOGENIC COOLER LAB

CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 010
VOLTAGE: 17.5
AMBIENT:

DATE: 10 DEC 1986 11:01
ENGR: H K
PROG: CATP* 1.0

TEST: POST LOW TEMP. PERFORMANCE TEST < 24 DEG. C >

TIME	POWER	CURRENT	KELVIN	LOAD
0.00	16.85	.963	300.34	0.000
1.00	18.63	1.070	247.64	0.000
2.00	19.37	1.101	200.00	0.000
3.00	20.25	1.153	157.10	0.000
4.00	21.20	1.215	118.64	0.000
4.67	22.16	1.266	96.09	0.000
5.00	22.50	1.310	86.04	0.000
5.23	23.49	1.342	80.00	0.000
6.00	23.65	1.398	62.04	0.000
7.00	25.00	1.486	49.75	0.000
8.00	25.70	1.503	44.70	0.000
9.00	26.25	1.499	42.56	0.000
10.00	26.60	1.478	41.56	0.000
11.00	26.54	1.544	40.91	0.000
12.00	26.94	1.516	40.25	0.000
13.00	26.73	1.547	40.30	0.000
14.00	26.91	1.537	40.15	0.000
15.00	26.77	1.570	40.07	0.000
16.00	26.96	1.509	40.15	0.000
17.00	27.12	1.555	40.00	0.000
18.00	26.94	1.533	40.15	0.000
19.00	27.20	1.519	40.15	0.000
20.00	27.32	1.558	40.11	0.000
21.00	27.27	1.520	40.11	0.000
22.00	26.89	1.512	40.92	.195
23.00	26.60	1.490	54.00	.273
24.00	26.90	1.525	59.23	.344
25.00	25.76	1.458	62.24	.344
26.00	25.63	1.470	63.52	.344
27.00	25.90	1.462	64.25	.344
28.00	25.97	1.433	64.58	.344
29.00	25.71	1.471	64.79	.344
30.00	25.90	1.499	65.03	.344
31.00	25.71	1.480	65.03	.344
32.00	25.48	1.469	64.66	.344
33.00	25.78	1.472	64.62	.344
34.00	25.56	1.451	64.75	.344
35.00	25.39	1.428	64.83	.344
36.00	25.79	1.481	64.83	.344
37.00	25.68	1.476	64.79	.343
38.00	25.78	1.454	64.87	.343
39.00	25.86	1.454	64.91	.343
40.00	25.52	1.464	64.87	.343
41.00	25.46	1.461	64.91	.343

Table 1.2.6

NVEOL CRYOGENIC COOLER LAB

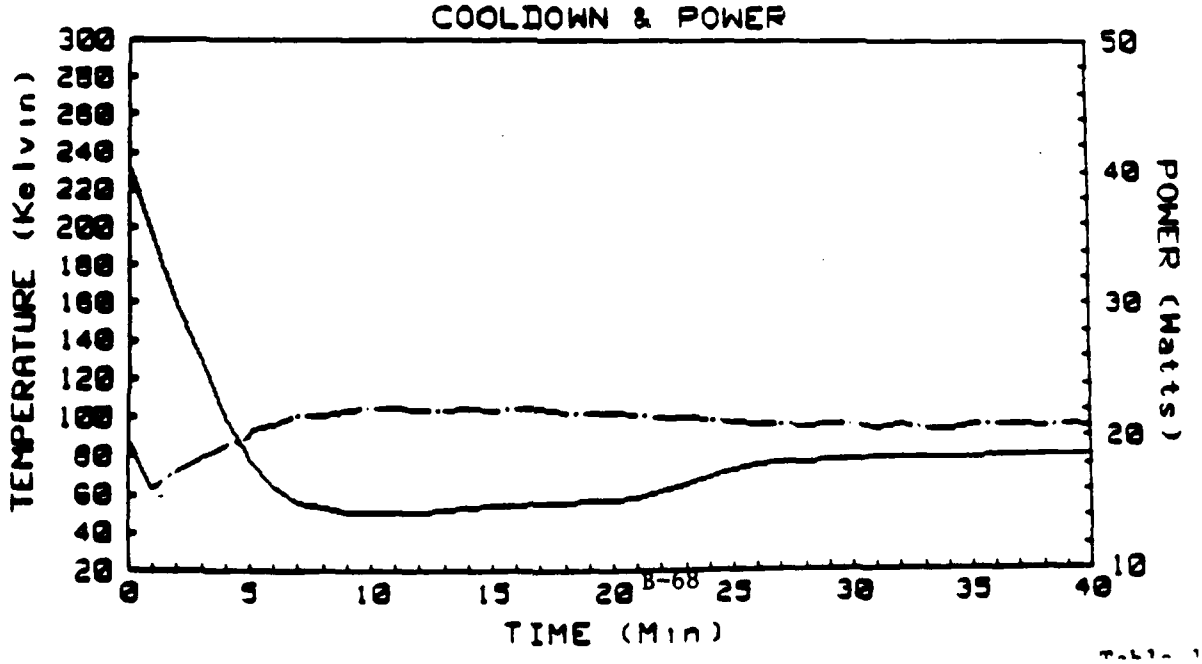
CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 817
VOLTAGE: 17.5
AMBIENT:

DATE: 13 DEC 86 11:32
ENGR: HLD
PROG: CATP+ 1.0

TEST: LOW TEMPERATURE PERFORMANCE TEST

TIME	POWER	CURRENT	KELVIN	LOAD
0.00	19.44	1.111	231.60	0.000
1.00	16.21	.921	195.44	0.000
2.00	17.36	.998	159.74	0.000
3.00	18.47	1.068	128.09	0.000
4.00	19.27	1.143	108.46	0.000
4.13	19.50	1.115	97.85	0.000
5.00	20.05	1.125	78.69	0.000
5.13	20.49	1.171	76.74	0.000
6.00	20.91	1.253	63.80	0.000
7.00	21.64	1.232	56.13	0.000
8.00	21.66	1.289	52.81	0.000
9.00	22.06	1.261	51.06	0.000
10.00	22.13	1.220	50.54	0.000
11.00	22.24	1.263	50.00	0.000
12.00	21.97	1.263	51.36	0.000
13.00	22.05	1.296	52.52	0.000
14.00	22.09	1.250	53.22	0.000
15.00	21.94	1.226	54.00	0.000
16.00	22.15	1.251	54.70	0.000
17.00	22.09	1.251	55.39	0.000
18.00	21.72	1.240	[illegible]5.17	0.000
19.00	21.77	1.167	[illegible]6.83	0.000
20.00	21.81	1.221	[illegible]7.48	0.000
30.00	20.94	1.202	[illegible]3.46	.193
40.00	20.68	1.169	30.23	.193



NVEOL CRYOGENIC COOLER LAB

CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 817
VOLTAGE: 17.5
AMBIENT:

DATE: 13 DEC 86 11:32
ENGR: HLD
PROG: CATP+ 1.0

TEST: LOW TEMPERATURE PERFORMANCE TEST

TIME	POWER	CURRENT	KELVIN	LOAD
0.00	19.44	1.111	231.68	0.000
1.00	16.21	.921	195.44	0.000
2.00	17.36	.998	159.74	0.000
3.00	18.47	1.068	128.09	0.000
4.00	19.27	1.143	100.46	0.000
4.13	19.58	1.115	97.05	0.000
5.00	20.05	1.125	78.69	0.000
5.13	20.49	1.171	76.74	0.000
6.00	20.91	1.253	63.00	0.000
7.00	21.64	1.232	56.13	0.000
8.00	21.66	1.209	52.81	0.000
9.00	22.06	1.261	51.06	0.000
10.00	22.13	1.220	50.54	0.000
11.00	22.24	1.263	50.00	0.000
12.00	21.97	1.263	51.36	0.000
13.00	22.05	1.296	52.52	0.000
14.00	22.09	1.258	53.22	0.000
15.00	21.94	1.226	54.00	0.000
16.00	22.15	1.251	54.78	0.000
17.00	22.09	1.251	55.39	0.000
18.00	21.72	1.240	56.17	0.000
19.00	21.77	1.167	56.83	0.000
20.00	21.81	1.221	57.48	0.000
21.00	21.55	1.227	58.09	0.000
22.00	21.44	1.229	61.83	.079
23.00	21.53	1.233	65.53	.118
24.00	21.23	1.189	69.48	.167
25.00	21.04	1.178	73.36	.193
26.00	20.94	1.220	75.20	.193
27.00	21.00	1.215	76.55	.193
28.00	20.74	1.215	77.35	.193
29.00	20.91	1.206	78.00	.193
30.00	20.94	1.202	78.46	.193
31.00	20.59	1.183	78.85	.193
32.00	20.87	1.157	79.00	.193
33.00	20.61	1.195	79.35	.193
34.00	20.59	1.163	79.66	.193
35.00	21.01	1.190	79.77	.193
36.00	20.89	1.178	79.92	.193
37.00	20.86	1.161	80.12	.193
38.00	20.75	1.163	80.12	.193
39.00	20.92	1.183	80.23	.193
40.00	20.68	1.169	80.23	.193
41.00	20.84	1.188	80.23	.193

Table 1.2.8

NVEOL CRYOGENIC COOLER LAB

CRYOGENIC COOLER DATA

COOLER: MAGNAVOX #17
VOLTAGE: 17.5
AMBIENT:

DATE: 15 DEC 86 11:25
ENGR: HLD
PROG: CATP* 1.0

TEST: POST LOW TEMPERATURE PERFORMANCE TEST

TIME	POWER	CURRENT	KELVIN	LOAD
0.00	15.36	.870	293.94	0.000
1.00	-16.72	1.005	242.69	0.000
2.00	17.52	1.029	194.43	0.000
3.00	18.66	1.070	150.31	0.000
4.00	19.83	1.157	110.70	0.000
4.33	20.50	1.176	99.35	0.000
5.00	21.20	1.299	77.20	0.000
5.12	22.34	1.276	74.13	0.000
6.00	22.03	1.347	53.71	0.000
7.00	23.64	1.382	43.00	0.000
8.00	24.65	1.453	38.90	0.000
9.00	25.14	1.439	36.70	0.000
10.00	25.23	1.477	35.60	0.000
11.00	25.40	1.483	35.15	0.000
12.00	25.91	1.497	34.89	0.000
13.00	25.53	1.438	34.73	0.000
14.00	25.51	1.404	34.70	0.000
15.00	25.64	1.495	34.62	0.000
16.00	25.47	1.477	34.70	0.000
17.00	25.70	1.452	34.70	0.000
18.00	25.71	1.472	34.73	0.000
19.00	25.80	1.456	34.73	0.000
20.00	25.77	1.437	34.73	0.000
30.00	23.60	1.362	61.79	.344
40.00	22.82	1.273	64.25	.344

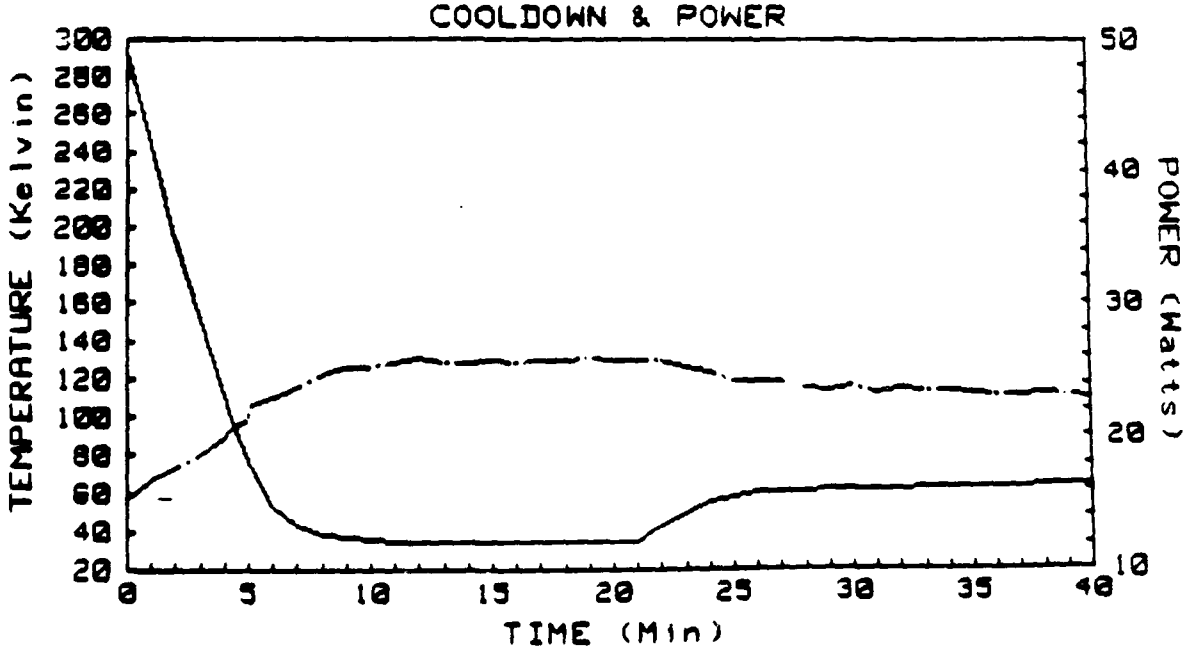


Table 1.2.9

NVEOL CRYOGENIC COOLER LAB

CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 817
VOLTAGE: 17.5
AMBIENT:

DATE: 15 DEC 86 11:25
ENGR: HLD
PROG: CATP* 1.0

TEST: POST LOW TEMPERATURE PERFORMANCE TEST

TIME	POWER	CURRENT	KELVIN	LOAD
0.00	15.36	.870	293.94	0.000
1.00	16.72	1.005	242.69	0.000
2.00	17.52	1.029	194.43	0.000
3.00	18.66	1.070	150.31	0.000
4.00	19.83	1.157	110.78	0.000
4.33	20.50	1.176	99.35	0.000
5.00	21.28	1.299	77.20	0.000
5.12	22.34	1.276	74.13	0.000
6.00	22.83	1.347	53.71	0.000
7.00	23.64	1.382	43.00	0.000
8.00	24.65	1.453	38.90	0.000
9.00	25.14	1.439	36.70	0.000
10.00	25.23	1.477	35.60	0.000
11.00	25.48	1.483	35.15	0.000
12.00	25.91	1.497	34.89	0.000
13.00	25.53	1.438	34.73	0.000
14.00	25.51	1.404	34.70	0.000
15.00	25.64	1.495	34.62	0.000
16.00	25.47	1.477	34.70	0.000
17.00	25.70	1.452	34.70	0.000
18.00	25.71	1.472	34.73	0.000
19.00	25.80	1.456	34.73	0.000
20.00	25.77	1.437	34.73	0.000
21.00	25.64	1.516	34.77	0.000
22.00	25.61	1.463	43.87	.195
23.00	25.16	1.413	49.06	.273
24.00	24.79	1.436	55.23	.363
25.00	24.18	1.388	58.70	.363
26.00	24.02	1.404	60.29	.363
27.00	24.11	1.375	61.10	.344
28.00	23.57	1.337	61.06	.344
29.00	23.35	1.321	61.39	.344
30.00	23.68	1.362	61.79	.344
31.00	23.28	1.322	62.08	.344
32.00	23.56	1.365	62.37	.344
33.00	23.32	1.311	62.69	.344
34.00	23.33	1.353	63.02	.344
35.00	23.24	1.323	63.31	.344
36.00	22.90	1.378	63.52	.344
37.00	23.04	1.309	63.72	.344
38.00	23.14	1.297	63.88	.344
39.00	22.99	1.305	64.01	.344
40.00	22.82	1.273	64.25	.344
41.00	22.76	1.306	64.38	.344

Table 1.2.10

NVEOL CRYOGENIC COOLER LAB

CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 018
VOLTAGE: 17.5
AMBIENT: 71 °C

DATE: 7 DEC 86 19:06
ENGR: H K
PROG: CATP* 1.0

TEST: TEST AT 71 DEG C <AFTER 48 HOUR BAKE>

TIME	POWER	CURRENT	KELVIN	LOAD
0.00	21.92	1.253	345.00	0.000
1.00	21.62	1.236	289.50	0.000
2.00	22.30	1.317	237.81	0.000
3.00	22.86	1.331	192.34	0.000
4.00	24.02	1.439	152.63	0.000
5.00	25.20	1.475	119.71	0.000
5.77	25.49	1.456	99.65	0.000
6.00	25.80	1.481	93.81	0.000
6.77	26.80	1.531	78.96	0.000
7.00	27.10	1.569	75.81	0.000
8.00	27.74	1.635	63.47	0.000
9.00	28.35	1.650	57.77	0.000
10.00	28.29	1.607	55.10	0.000
11.00	28.39	1.656	54.04	0.000
12.00	28.84	1.646	53.79	0.000
13.00	28.80	1.652	53.92	0.000
14.00	28.61	1.619	54.24	0.000
15.00	28.76	1.655	53.96	0.000
16.00	28.75	1.691	52.93	0.000
17.00	28.44	1.645	51.76	0.000
18.00	28.51	1.631	50.88	0.000
19.00	28.96	1.693	50.19	0.000
20.00	28.90	1.704	49.58	0.000
30.00	27.38	1.538	70.47	.207
40.00	28.28	1.582	72.67	.207

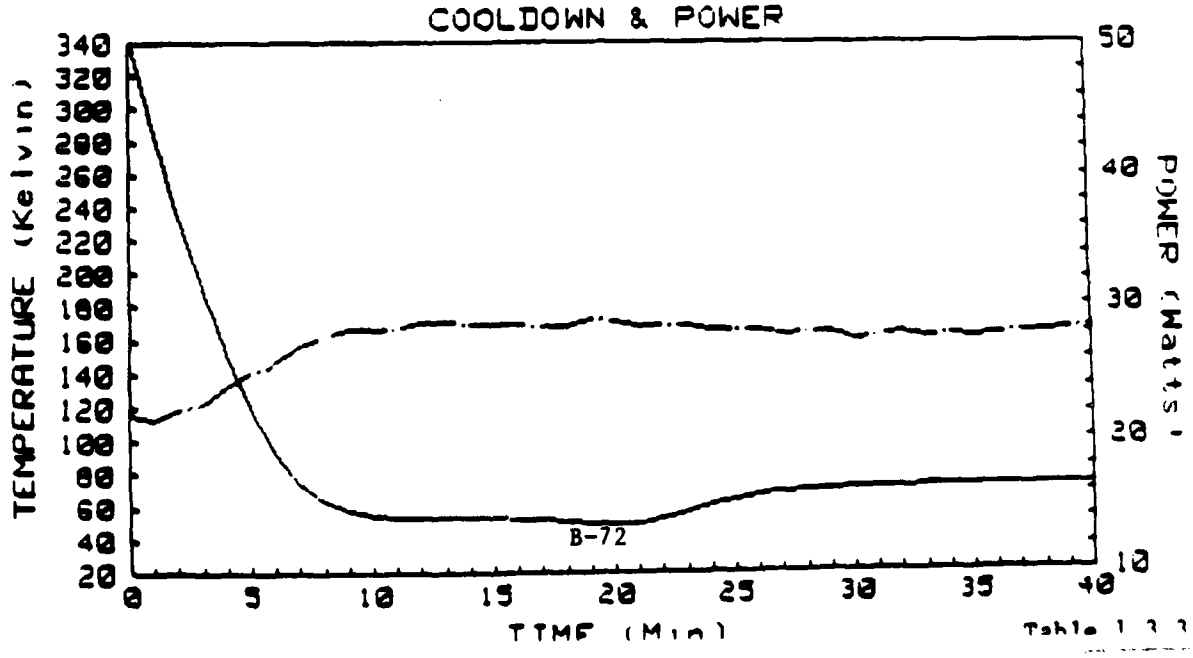


Table 1.3.3

NVEOL CRYOGENIC COOLER LAB

CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 810
VOLTAGE: 17.5
AMBIENT:

DATE: 7 DEC 86 19:07
ENGR: H K
PROG: CATP* 1.0

TEST: TEST AT 71 DEG C <AFTER 48 HOUR BAKE>

TIME	POWER	CURRENT	KELVIN	LOAD
0.00	21.92	1.253	345.00	0.000
1.00	21.62	1.236	289.50	0.000
2.00	22.30	1.317	237.81	0.000
3.00	22.86	1.331	192.34	0.000
4.00	24.02	1.439	152.63	0.000
5.00	25.20	1.475	119.71	0.000
5.77	25.49	1.456	99.65	0.000
6.00	25.80	1.481	93.81	0.000
6.77	26.80	1.531	78.96	0.000
7.00	27.10	1.569	75.81	0.000
8.00	27.74	1.635	63.47	0.000
9.00	28.35	1.650	57.77	0.000
10.00	28.29	1.607	55.10	0.000
11.00	28.39	1.656	54.04	0.000
12.00	28.04	1.646	53.79	0.000
13.00	28.00	1.652	53.92	0.000
14.00	28.61	1.619	54.24	0.000
15.00	28.76	1.655	53.96	0.000
16.00	28.75	1.691	52.93	0.000
17.00	28.44	1.645	51.76	0.000
18.00	28.51	1.631	50.00	0.000
19.00	28.96	1.693	50.19	0.000
20.00	28.90	1.704	49.50	0.000
21.00	28.56	1.619	49.01	0.000
22.00	28.51	1.667	52.93	.078
23.00	28.53	1.684	56.21	.129
24.00	28.10	1.590	60.57	.179
25.00	28.20	1.655	64.25	.207
26.00	28.07	1.632	66.55	.207
27.00	27.87	1.636	68.10	.207
28.00	27.96	1.617	69.17	.207
29.00	27.91	1.621	69.94	.207
30.00	27.30	1.530	70.47	.207
31.00	27.53	1.561	70.93	.207
32.00	28.02	1.571	71.27	.207
33.00	27.60	1.560	71.66	.207
34.00	27.87	1.568	71.90	.207
35.00	27.66	1.577	72.02	.207
36.00	27.86	1.602	72.21	.207
37.00	27.99	1.565	72.44	.207
38.00	27.90	1.569	72.48	.207
39.00	28.00	1.612	72.59	.207
40.00	28.20	1.582	72.67	.207
41.00	28.10	1.667	72.82	.207

Table 1.3.4

NVEOL CRYOGENIC COOLER LAB

CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 010
VOLTAGE: 17.5
AMBIENT: 23°C

DATE: 7 DEC 1986 21:26
ENGR: H K
PROG: CATP* 1.8

TEST: POST 48 HOUR 71 DEG.C BAKE <TEST RUN AT 23 DEG.C AMB. TEMP.>

TIME	POWER	CURRENT	KELVIN	LOAD
0.00	19.51	1.115	300.40	0.000
1.00	18.17	1.038	251.17	0.000
2.00	18.95	1.112	204.19	0.000
3.00	19.65	1.136	161.57	0.000
4.00	21.86	1.224	123.67	0.000
4.77	22.71	1.297	98.80	0.000
5.00	22.22	1.268	91.27	0.000
5.45	22.98	1.313	79.39	0.000
6.00	23.52	1.346	66.55	0.000
7.00	24.35	1.428	53.09	0.000
8.00	25.27	1.499	47.23	0.000
9.00	25.76	1.451	45.22	0.000
10.00	25.75	1.449	44.96	0.000
11.00	25.73	1.449	44.74	0.000
12.00	26.12	1.458	44.79	0.000
13.00	26.09	1.458	44.87	0.000
14.00	26.28	1.518	45.13	0.000
15.00	26.29	1.518	45.35	0.000
16.00	26.36	1.521	45.44	0.000
17.00	26.09	1.474	45.74	0.000
18.00	26.22	1.535	45.66	0.000
19.00	25.99	1.551	45.96	0.000
20.00	26.49	1.514	46.27	0.000
30.00	25.65	1.522	73.24	.343
40.00	25.59	1.485	72.82	.342

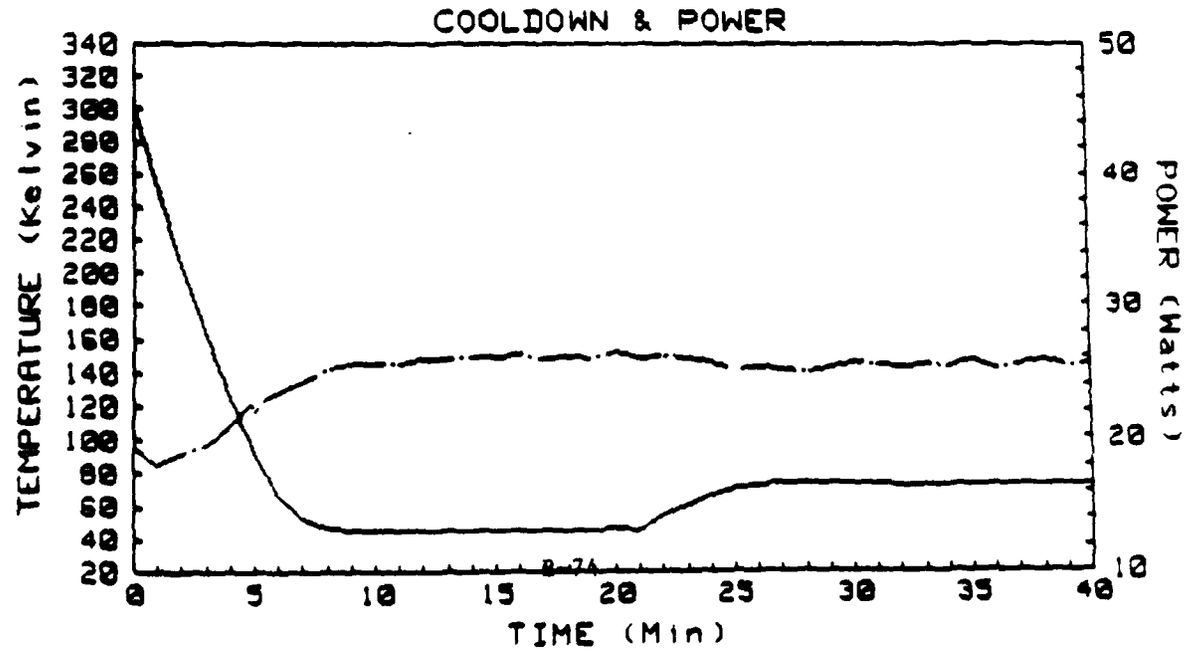


Table 1.2.5

NVEOL CRYOGENIC COOLER LAB

CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 810
VOLTAGE: 17.5
AMBIENT: 23°C

DATE: 7 DEC 1986 21:26
ENGR: H K
PROG: CATP* 1.0

TEST: POST 48 HOUR 71 DEG.C BAKE <TEST RUN AT 23 DEG.C AMB. TEMP.>

TIME	POWER	CURRENT	KELVIN	LOAD
0.00	19.51	1.115	300.40	0.000
1.00	18.17	1.030	251.17	0.000
2.00	18.95	1.112	204.19	0.000
3.00	19.65	1.136	161.57	0.000
4.00	21.86	1.224	123.67	0.000
4.77	22.71	1.297	98.88	0.000
5.00	22.22	1.268	91.27	0.000
5.45	22.98	1.313	79.39	0.000
6.00	23.52	1.346	66.55	0.000
7.00	24.35	1.428	53.89	0.000
8.00	25.27	1.499	47.23	0.000
9.00	25.76	1.451	45.22	0.000
10.00	25.75	1.449	44.96	0.000
11.00	25.73	1.449	44.74	0.000
12.00	26.12	1.458	44.79	0.000
13.00	26.09	1.450	44.87	0.000
14.00	26.28	1.518	45.13	0.000
15.00	26.29	1.518	45.35	0.000
16.00	26.36	1.521	45.44	0.000
17.00	26.09	1.474	45.74	0.000
18.00	26.22	1.535	45.66	0.000
19.00	25.99	1.551	45.96	0.000
20.00	26.49	1.514	46.27	0.000
21.00	26.11	1.521	46.01	0.000
22.00	26.20	1.460	55.93	.195
23.00	25.95	1.501	61.47	.256
24.00	25.66	1.476	66.84	.342
25.00	25.20	1.482	71.12	.343
26.00	25.28	1.451	72.71	.343
27.00	25.20	1.486	73.36	.343
28.00	24.95	1.420	74.01	.343
29.00	25.30	1.420	73.94	.343
30.00	25.65	1.522	73.24	.343
31.00	25.48	1.448	72.90	.343
32.00	25.37	1.446	72.59	.343
33.00	25.45	1.484	72.44	.343
34.00	25.29	1.438	72.32	.342
35.00	25.78	1.439	72.51	.342
36.00	25.13	1.431	72.59	.342
37.00	25.54	1.474	72.59	.342
38.00	25.81	1.431	72.67	.342
39.00	25.27	1.452	72.71	.342
40.00	25.59	1.485	72.82	.342
41.00	25.46	1.458	72.78	.342

Table 1.3.6

NVEOL CRYOGENIC COOLER LAB

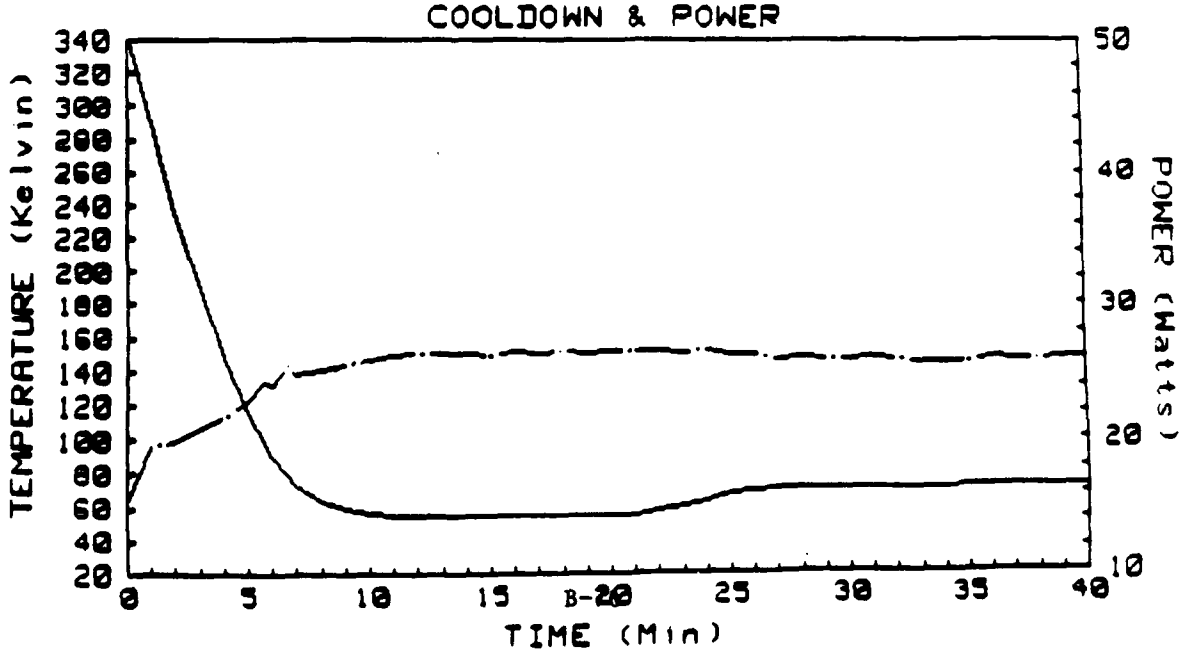
CRYOGENIC COOLER DATA

COOLER: Magnavox 817
VOLTAGE: 17.5
AMBIENT:

DATE: 03 December 86 15:28
ENGR: Henry Kling
PROG: CATP* 1.0

TEST: High Temp test (done at 71 C after 48 hours of baking)

TIME	POWER	CURRENT	KELVIN	LOAD
0.00	15.53	.887	346.43	0.000
1.00	19.50	1.148	289.90	0.000
2.00	19.00	1.129	235.00	0.000
3.00	20.90	1.226	189.01	0.000
4.00	21.59	1.235	148.60	0.000
5.00	22.86	1.320	115.36	0.000
5.65	24.22	1.384	90.27	0.000
6.00	23.89	1.380	90.32	0.000
6.65	25.50	1.457	70.71	0.000
7.00	24.81	1.427	73.60	0.000
8.00	25.14	1.502	64.00	0.000
9.00	25.55	1.462	59.21	0.000
10.00	25.86	1.502	56.74	0.000
11.00	26.19	1.499	55.54	0.000
12.00	26.31	1.487	54.92	0.000
13.00	26.38	1.528	54.67	0.000
14.00	26.39	1.500	54.54	0.000
15.00	26.30	1.516	54.50	0.000
16.00	26.64	1.540	54.50	0.000
17.00	26.32	1.494	54.63	0.000
18.00	26.55	1.536	54.67	0.000
19.00	26.43	1.518	54.71	0.000
20.00	26.52	1.548	54.83	0.000
30.00	25.91	1.485	71.03	.200
40.00	26.02	1.492	71.61	.200



NVEOL CRYOGENIC COOLER LAB

CRYOGENIC COOLER DATA

COOLER: Magnavox 017
VOLTAGE: 17.5
AMBIENT:

DATE: 03 December 86 15:27
ENGR: Henry Kling
PROG: CATP+ 1.0

TEST: High Temp test (done at 71 C after 48 hours of baking)

TIME	POWER	CURRENT	KELVIN	LOAD
0.00	15.53	.887	346.43	0.000
1.00	19.58	1.148	289.98	0.000
2.00	19.88	1.129	235.88	0.000
3.00	20.98	1.226	189.81	0.000
4.00	21.59	1.235	148.68	0.000
5.00	22.86	1.328	115.36	0.000
5.65	24.22	1.384	98.27	0.000
6.00	23.89	1.388	98.32	0.000
6.65	25.58	1.457	78.71	0.000
7.00	24.81	1.427	73.68	0.000
8.00	25.14	1.582	64.88	0.000
9.00	25.55	1.462	59.21	0.000
10.00	25.86	1.582	56.74	0.000
11.00	26.19	1.499	55.54	0.000
12.00	26.31	1.487	54.92	0.000
13.00	26.38	1.528	54.67	0.000
14.00	26.39	1.588	54.54	0.000
15.00	26.38	1.516	54.58	0.000
16.00	26.64	1.548	54.58	0.000
17.00	26.32	1.494	54.63	0.000
18.00	26.55	1.536	54.67	0.000
19.00	26.43	1.518	54.71	0.000
20.00	26.52	1.548	54.83	0.000
21.00	26.54	1.525	54.88	0.000
22.00	26.51	1.554	57.81	.079
23.00	26.41	1.523	60.63	.130
24.00	26.54	1.516	64.21	.179
25.00	26.23	1.477	67.55	.208
26.00	26.15	1.468	69.22	.208
27.00	25.89	1.483	70.05	.208
28.00	26.01	1.463	70.52	.208
29.00	25.95	1.473	70.87	.208
30.00	25.91	1.485	71.03	.208
31.00	26.00	1.437	71.15	.208
32.00	25.89	1.484	71.30	.208
33.00	25.69	1.475	71.38	.208
34.00	25.73	1.475	71.42	.208
35.00	25.77	1.481	71.46	.208
36.00	25.97	1.538	71.50	.208
37.00	25.82	1.507	71.58	.208
38.00	25.88	1.481	71.69	.208
39.00	26.12	1.454	71.61	.208
40.00	26.02	1.492	71.61	.208
41.00	25.59	1.442	71.73	.208

NVEOL CRYOGENIC COOLER LAB

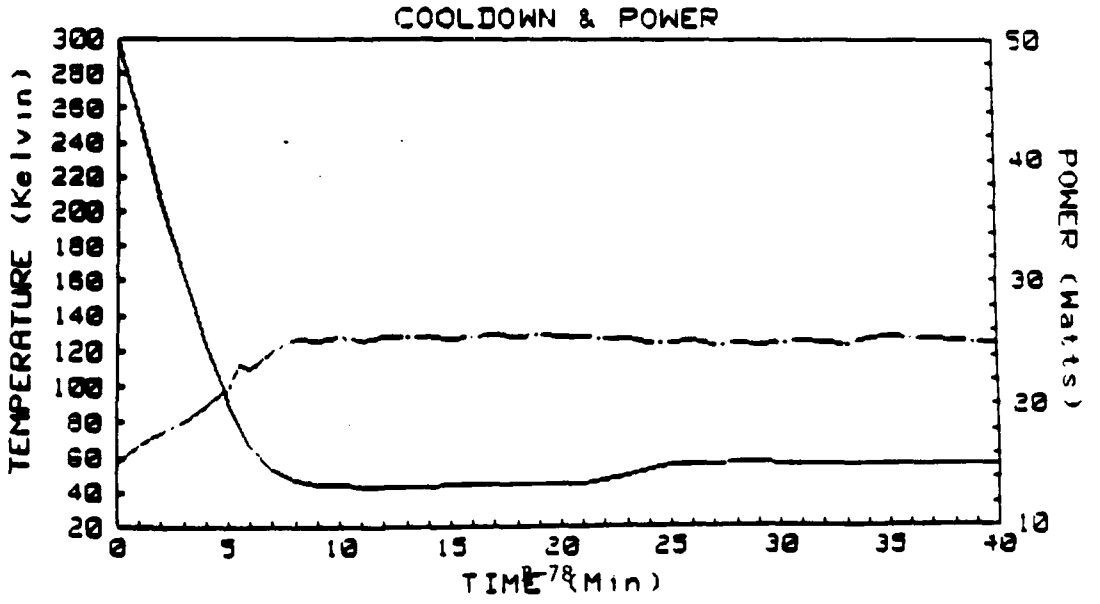
CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 017
VOLTAGE: 17.5
AMBIENT:

DATE: 5 DEC 86 14:41
ENGR: HAL
PROG: CATP* 1.0

TEST: Post High Temp baseline (at ambient).

TIME	POWER	CURRENT	KELVIN	LOAD
0.00	15.21	.869	298.99	0.000
1.00	16.70	.980	252.67	0.000
2.00	17.67	1.030	205.24	0.000
3.00	18.72	1.087	162.25	0.000
4.00	19.82	1.170	123.89	0.000
4.77	21.06	1.203	98.88	0.000
5.00	21.17	1.229	91.16	0.000
5.45	23.14	1.322	79.46	0.000
6.00	22.84	1.364	66.43	0.000
7.00	24.24	1.419	52.81	0.000
8.00	25.25	1.479	47.23	0.000
9.00	25.21	1.398	44.87	0.000
10.00	25.51	1.468	44.09	0.000
11.00	25.17	1.448	43.74	0.000
12.00	25.54	1.493	43.78	0.000
13.00	25.57	1.518	43.78	0.000
14.00	25.45	1.479	43.91	0.000
15.00	25.40	1.462	44.09	0.000
16.00	25.44	1.423	44.18	0.000
17.00	25.76	1.420	44.18	0.000
18.00	25.50	1.406	44.13	0.000
19.00	25.66	1.434	44.22	0.000
20.00	25.46	1.490	44.26	0.000
30.00	24.94	1.433	55.00	.193
40.00	24.94	1.416	56.09	.193



NVEOL CRYOGENIC COOLER LAB

CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 017
VOLTAGE: 17.9
AMBIENT: 23°C

DATE: 5 DEC 86 14:41
ENGR: HAL
PROG: CATP+ 1.0

TEST: Post High Temp baseline (at ambient).

TIME	POWER	CURRENT	KELVIN	LOAD
0.00	15.21	.869	298.99	0.000
1.00	16.78	.988	252.67	0.000
2.00	17.67	1.030	205.24	0.000
3.00	18.72	1.087	162.25	0.000
4.00	19.82	1.178	123.89	0.000
4.77	21.06	1.203	98.88	0.000
5.00	21.17	1.229	91.16	0.000
5.45	23.14	1.322	79.46	0.000
6.00	22.84	1.364	66.43	0.000
7.00	24.24	1.419	52.81	0.000
8.00	25.25	1.479	47.23	0.000
9.00	25.21	1.398	44.87	0.000
10.00	25.51	1.468	44.09	0.000
11.00	25.17	1.448	43.74	0.000
12.00	25.54	1.493	43.70	0.000
13.00	25.57	1.518	43.70	0.000
14.00	25.45	1.479	43.91	0.000
15.00	25.40	1.462	44.09	0.000
16.00	25.44	1.423	44.18	0.000
17.00	25.76	1.428	44.18	0.000
18.00	25.50	1.406	44.13	0.000
19.00	25.66	1.434	44.22	0.000
20.00	25.46	1.498	44.26	0.000
21.00	25.58	1.419	44.39	0.000
22.00	25.27	1.475	47.78	.079
23.00	25.27	1.473	50.06	.118
24.00	25.04	1.448	52.85	.167
25.00	24.99	1.433	55.39	.193
26.00	25.10	1.484	56.05	.193
27.00	24.81	1.409	56.09	.193
28.00	24.95	1.418	56.66	.193
29.00	24.88	1.444	56.54	.193
30.00	24.94	1.433	55.88	.193
31.00	25.20	1.425	55.93	.193
32.00	24.91	1.378	55.93	.193
33.00	24.87	1.425	55.84	.193
34.00	25.41	1.488	55.97	.193
35.00	25.58	1.438	55.97	.193
36.00	25.25	1.486	56.01	.193
37.00	25.38	1.466	56.01	.193
38.00	25.09	1.495	56.09	.193
39.00	25.05	1.428	56.09	.193
40.00	24.94	1.416	56.09	.193
41.00	25.06	1.432	56.09	.193

NVEOL CRYOGENIC COOLER LAB

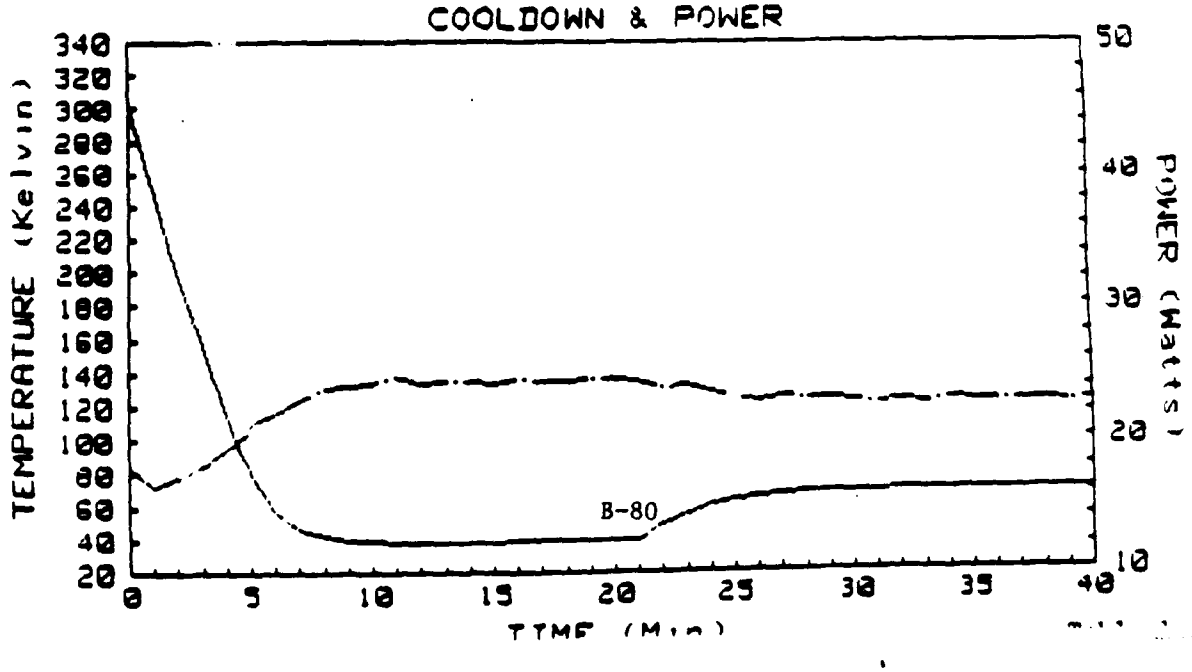
CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 817
VOLTAGE: 17.5
AMBIENT:

DATE: 17 DEC 86 16:56
ENGR: HLD
PROG: CATP+ 1.0

TEST: POST MECHANICAL SHOCK TEST

TIME	POWER	CURRENT	KELVIN	LOAD
0.00	17.97	1.027	302.64	0.000
1.00	16.51	.960	250.57	0.000
2.00	17.20	.983	200.99	0.000
3.00	18.12	1.060	156.96	0.000
4.00	19.34	1.154	116.18	0.000
4.55	20.10	1.149	97.33	0.000
5.00	20.70	1.219	82.50	0.000
5.12	21.44	1.225	79.42	0.000
6.00	21.90	1.291	58.17	0.000
7.00	23.03	1.321	46.40	0.000
8.00	23.91	1.373	41.91	0.000
9.00	24.10	1.405	40.04	0.000
10.00	24.20	1.386	39.13	0.000
11.00	24.72	1.413	38.75	0.000
12.00	24.30	1.395	38.67	0.000
13.00	24.45	1.411	38.67	0.000
14.00	24.45	1.381	38.79	0.000
15.00	24.35	1.401	38.90	0.000
16.00	24.68	1.408	39.09	0.000
17.00	24.47	1.369	39.24	0.000
18.00	24.47	1.386	39.35	0.000
19.00	24.69	1.373	39.47	0.000
20.00	24.58	1.420	39.62	0.000
30.00	22.90	1.325	68.29	.343
40.00	22.90	1.293	69.21	.343



NVEOL CRYOGENIC COOLER LAB

CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 817
VOLTAGE: 17.9
AMBIENT:

DATE: 17 DEC 86 16:57
ENGR: HLD
PROG: CATP* 1.0

TEST: POST MECHANICAL SHOCK TEST

TIME	POWER	CURRENT	KELVIN	LOAD
0.00	17.97	1.027	302.64	0.000
1.00	16.51	.960	250.57	0.000
2.00	17.20	.983	200.99	0.000
3.00	18.12	1.060	156.06	0.000
4.00	19.34	1.154	116.10	0.000
4.55	20.10	1.149	97.33	0.000
5.00	20.70	1.219	82.50	0.000
5.12	21.44	1.225	79.42	0.000
6.00	21.90	1.291	58.17	0.000
7.00	23.03	1.321	46.40	0.000
8.00	23.91	1.373	41.91	0.000
9.00	24.18	1.405	40.04	0.000
10.00	24.20	1.386	39.13	0.000
11.00	24.72	1.413	38.75	0.000
12.00	24.30	1.395	38.67	0.000
13.00	24.45	1.411	38.67	0.000
14.00	24.45	1.381	38.79	0.000
15.00	24.35	1.401	38.90	0.000
16.00	24.60	1.400	39.09	0.000
17.00	24.47	1.369	39.24	0.000
18.00	24.47	1.386	39.35	0.000
19.00	24.69	1.373	39.47	0.000
20.00	24.58	1.420	39.62	0.000
21.00	24.49	1.432	39.81	0.000
22.00	24.00	1.371	48.97	.195
23.00	24.14	1.343	54.78	.273
24.00	23.56	1.311	60.49	.343
25.00	23.20	1.302	63.80	.343
26.00	22.78	1.335	65.57	.343
27.00	23.27	1.320	66.63	.343
28.00	23.04	1.285	67.60	.343
29.00	22.90	1.336	67.99	.343
30.00	22.90	1.325	68.29	.343
31.00	22.77	1.314	68.52	.343
32.00	22.89	1.288	68.64	.343
33.00	22.73	1.320	68.79	.343
34.00	22.98	1.290	68.90	.343
35.00	22.80	1.324	68.90	.343
36.00	22.79	1.336	69.06	.343
37.00	22.84	1.298	68.98	.343
38.00	22.80	1.296	69.17	.343
39.00	22.67	1.288	69.17	.343
40.00	22.90	1.293	69.21	.343
41.00	22.90	1.283	69.36	.343

NVEOL CRYOGENIC COOLER LAB

CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 810
VOLTAGE: 17.5
AMBIENT:

DATE: 17 DEC 86 15:10
ENGR: HLD
PROG: CATP+ 1.0

TEST: POST MECHANICAL SHOCK TEST

TIME	POWER	CURRENT	KELVIN	LOAD
0.00	15.40	.000	297.02	0.000
1.00	18.15	1.066	245.46	0.000
2.00	18.77	1.117	197.92	0.000
3.00	19.66	1.136	154.53	0.000
4.00	20.92	1.193	115.30	0.000
4.55	22.39	1.279	96.71	0.000
5.00	22.18	1.297	82.12	0.000
5.12	23.62	1.350	79.12	0.000
6.00	23.63	1.400	58.66	0.000
7.00	24.96	1.452	47.23	0.000
8.00	25.44	1.500	43.09	0.000
9.00	25.69	1.461	41.00	0.000
10.00	26.27	1.522	40.30	0.000
11.00	26.01	1.460	40.30	0.000
12.00	26.44	1.505	40.12	0.000
13.00	25.94	1.512	40.12	0.000
14.00	26.04	1.471	40.30	0.000
15.00	26.22	1.503	39.77	0.000
16.00	26.29	1.507	39.77	0.000
17.00	25.95	1.481	39.96	0.000
18.00	25.85	1.443	40.11	0.000
19.00	26.18	1.499	40.30	0.000
20.00	26.21	1.518	40.21	0.000
30.00	24.59	1.423	56.86	.343
40.00	24.87	1.420	56.92	.343

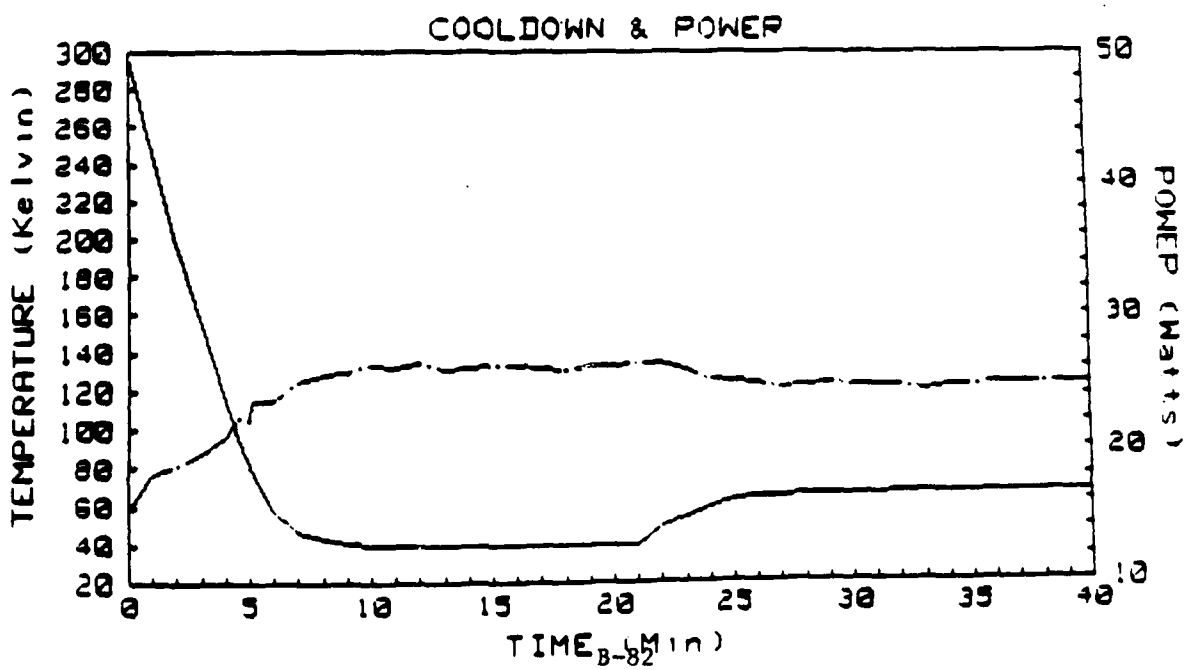


Table 1.4.5

NVEOL CRYOGENIC COOLER LAB

CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 010
VOLTAGE: 17.5
AMBIENT:

DATE: 17 DEC 86 15:10
ENGR: HLD
PROG: CATP* 1.0

TEST: POST MECHANICAL SHOCK TEST

TIME	POWER	CURRENT	KELVIN	LOAD
0.00	15.40	.000	297.02	0.000
1.00	18.15	1.066	245.46	0.000
2.00	18.77	1.117	197.92	0.000
3.00	19.66	1.136	154.53	0.000
4.00	20.92	1.193	115.30	0.000
4.55	22.39	1.279	96.71	0.000
5.00	22.18	1.297	82.12	0.000
5.12	23.62	1.350	79.12	0.000
6.00	23.63	1.400	58.66	0.000
7.00	24.96	1.452	47.23	0.000
8.00	25.44	1.500	43.89	0.000
9.00	25.69	1.461	41.80	0.000
10.00	26.27	1.522	40.30	0.000
11.00	26.01	1.468	40.30	0.000
12.00	26.44	1.505	40.12	0.000
13.00	25.94	1.512	40.12	0.000
14.00	26.04	1.471	40.30	0.000
15.00	26.22	1.503	39.77	0.000
16.00	26.29	1.507	39.77	0.000
17.00	25.95	1.481	39.96	0.000
18.00	25.85	1.443	40.11	0.000
19.00	26.18	1.499	40.30	0.000
20.00	26.21	1.518	40.21	0.000
21.00	26.35	1.495	40.34	0.000
22.00	26.34	1.504	49.06	.195
23.00	25.91	1.474	54.28	.273
24.00	25.20	1.425	59.56	.343
25.00	24.96	1.387	62.61	.343
26.00	24.83	1.425	64.09	.343
27.00	24.48	1.399	64.91	.343
28.00	24.56	1.365	65.44	.343
29.00	24.72	1.444	65.89	.343
30.00	24.59	1.423	66.06	.343
31.00	24.55	1.442	66.18	.343
32.00	24.63	1.413	66.35	.343
33.00	24.38	1.404	66.39	.343
34.00	24.71	1.417	66.47	.343
35.00	24.69	1.403	66.59	.343
36.00	24.76	1.416	66.63	.343
37.00	24.75	1.440	66.72	.343
38.00	24.73	1.422	66.80	.343
39.00	24.78	1.459	66.80	.343
40.00	24.87	1.420	66.92	.343
41.00	24.83	1.412	66.92	.343

NVEOL CRYOGENIC COOLER LAB

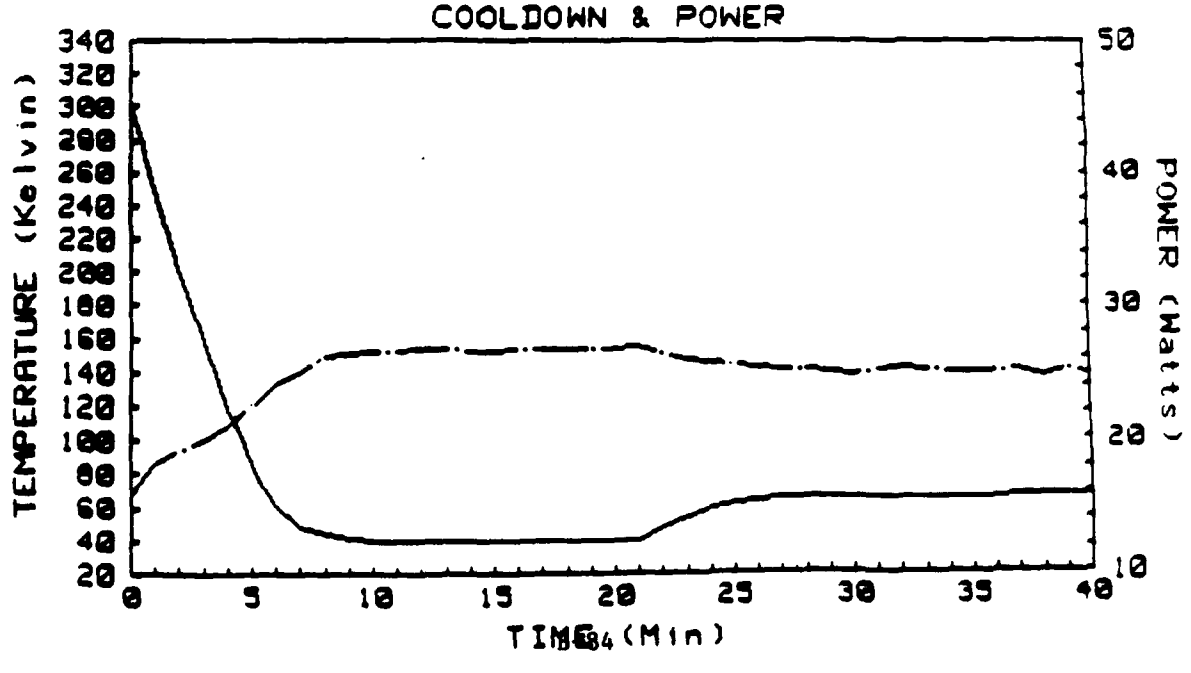
CRYOGENIC COOLER DATA

COOLER: MAGNAVOX 810
VOLTAGE: 17.5
AMBIENT:

DATE: 7 JAN 87 16:24
ENGR: HLD
PROG: CATP* 1.0

TEST: POST VIBRATION BASELINE TEST

TIME	POWER	CURRENT	KELVIN	LOAD
0.00	16.02	.916	301.90	0.000
1.00	18.30	1.055	250.01	0.000
2.00	19.16	1.100	202.49	0.000
3.00	19.90	1.102	150.81	0.000
4.00	21.10	1.233	119.37	0.000
4.67	22.23	1.270	97.22	0.000
5.00	22.70	1.361	86.00	0.000
5.23	22.77	1.301	79.77	0.000
6.00	24.16	1.435	61.14	0.000
7.00	25.00	1.510	48.62	0.000
8.00	26.14	1.456	43.52	0.000
9.00	26.35	1.457	41.34	0.000
10.00	26.64	1.530	40.43	0.000
11.00	26.50	1.530	40.39	0.000
12.00	26.77	1.502	39.50	0.000
13.00	26.60	1.542	39.62	0.000
14.00	26.57	1.531	39.92	0.000
15.00	26.62	1.471	39.73	0.000
16.00	26.60	1.542	39.85	0.000
17.00	26.74	1.477	40.22	0.000
18.00	26.66	1.557	39.96	0.000
19.00	26.76	1.502	40.04	0.000
20.00	26.66	1.502	40.22	0.000
30.00	24.86	1.441	65.36	.343
40.00	24.77	1.386	66.86	.343



NVEOL CRYOGENIC COOLER LAB

CRYOGENIC COOLER DATA

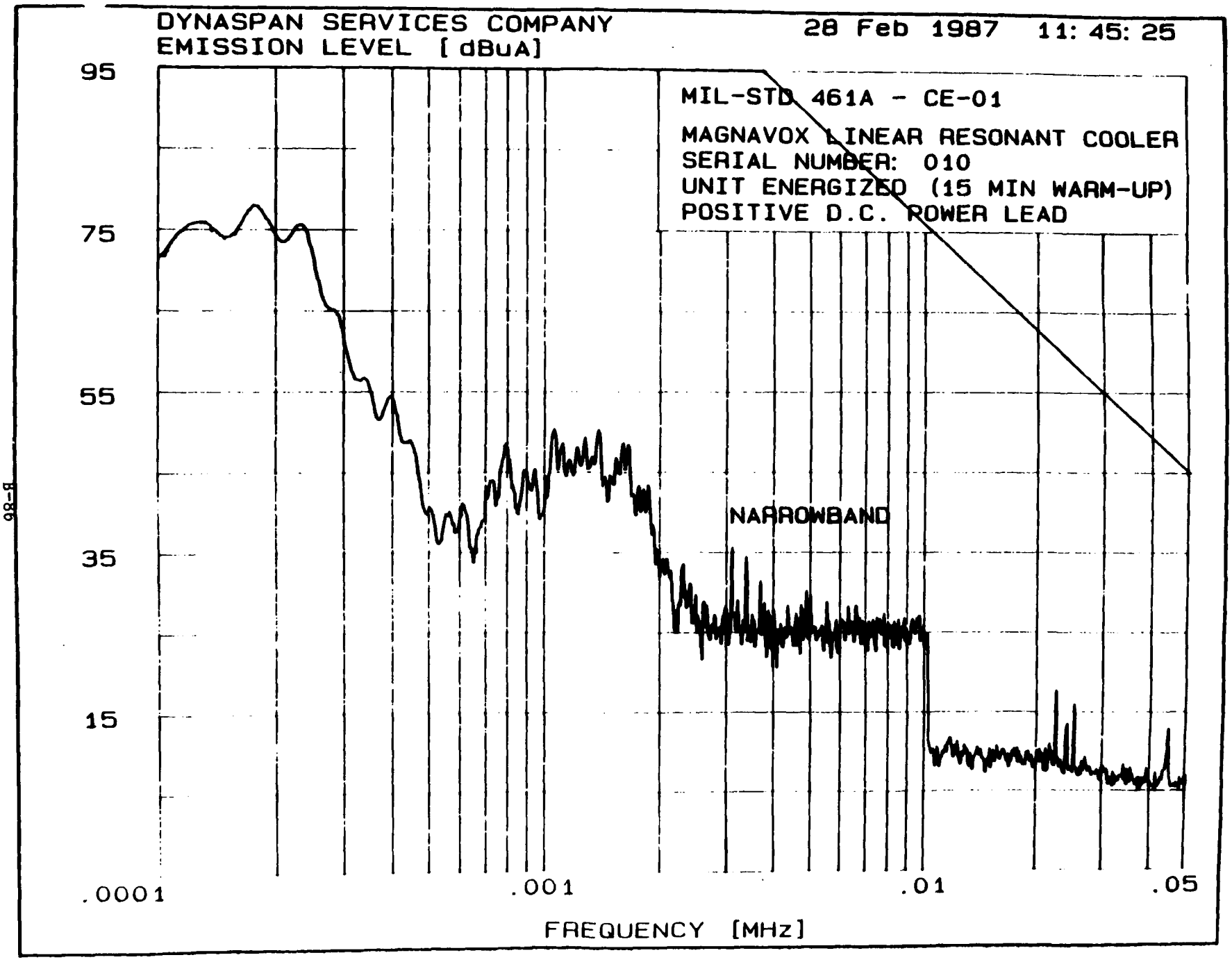
COOLER: MAGNAVOX 810
VOLTAGE: 17.5
AMBIENT:

DATE: 7 JAN 87 16:25
ENGR: HLD
PROG: CATP+ 1.0

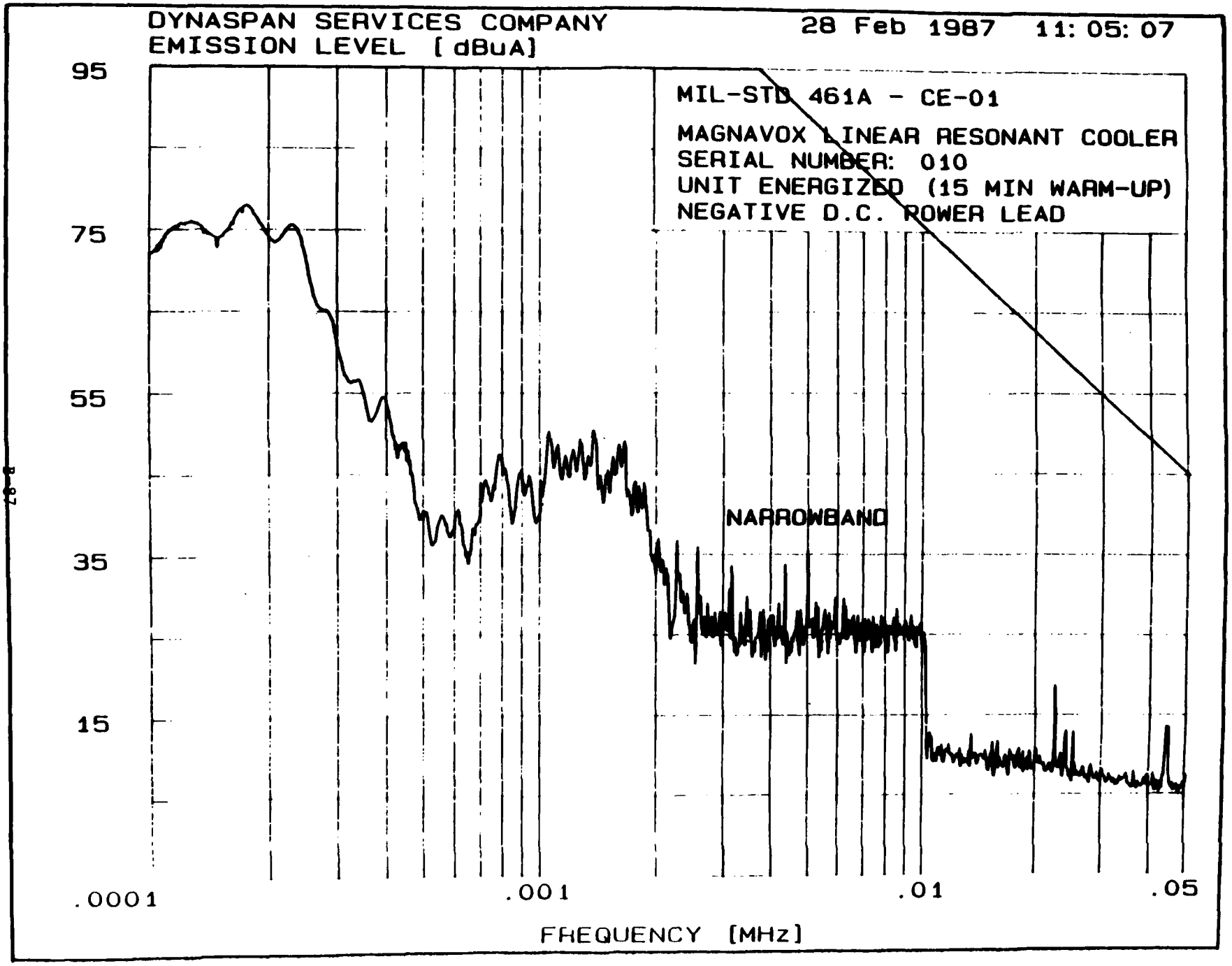
TEST: POST VIBRATION BASELINE TEST

TIME	POWER	CURRENT	KELVIN	LOAD
0.00	16.82	.916	301.90	0.000
1.00	18.30	1.055	250.81	0.000
2.00	19.16	1.100	202.49	0.000
3.00	19.98	1.182	158.81	0.000
4.00	21.10	1.233	119.37	0.000
4.67	22.23	1.270	97.22	0.000
5.00	22.70	1.361	86.00	0.000
5.23	22.77	1.301	79.77	0.000
6.00	24.16	1.435	61.14	0.000
7.00	25.00	1.510	48.62	0.000
8.00	26.14	1.456	43.52	0.000
9.00	26.35	1.457	41.34	0.000
10.00	26.64	1.530	40.43	0.000
11.00	26.58	1.530	40.39	0.000
12.00	26.77	1.502	39.58	0.000
13.00	26.68	1.542	39.62	0.000
14.00	26.57	1.531	39.92	0.000
15.00	26.62	1.471	39.73	0.000
16.00	26.68	1.542	39.85	0.000
17.00	26.74	1.477	40.22	0.000
18.00	26.66	1.557	39.96	0.000
19.00	26.76	1.502	40.04	0.000
20.00	26.66	1.502	40.22	0.000
21.00	26.92	1.569	40.15	0.000
22.00	26.31	1.507	40.66	.195
23.00	25.82	1.495	54.00	.273
24.00	25.60	1.441	59.35	.343
25.00	25.55	1.466	62.33	.343
26.00	25.29	1.447	63.76	.343
27.00	25.18	1.466	64.50	.343
28.00	25.22	1.464	65.03	.343
29.00	25.03	1.464	65.24	.343
30.00	24.86	1.441	65.36	.343
31.00	25.24	1.437	65.53	.343
32.00	25.39	1.435	65.57	.343
33.00	25.12	1.461	65.61	.343
34.00	24.93	1.465	65.77	.343
35.00	25.04	1.426	65.73	.343
36.00	25.07	1.403	65.77	.343
37.00	25.17	1.456	65.85	.343
38.00	24.69	1.404	65.98	.343
39.00	25.12	1.419	66.02	.343
40.00	24.77	1.386	66.06	.343
41.00	24.99	1.418	66.06	.343

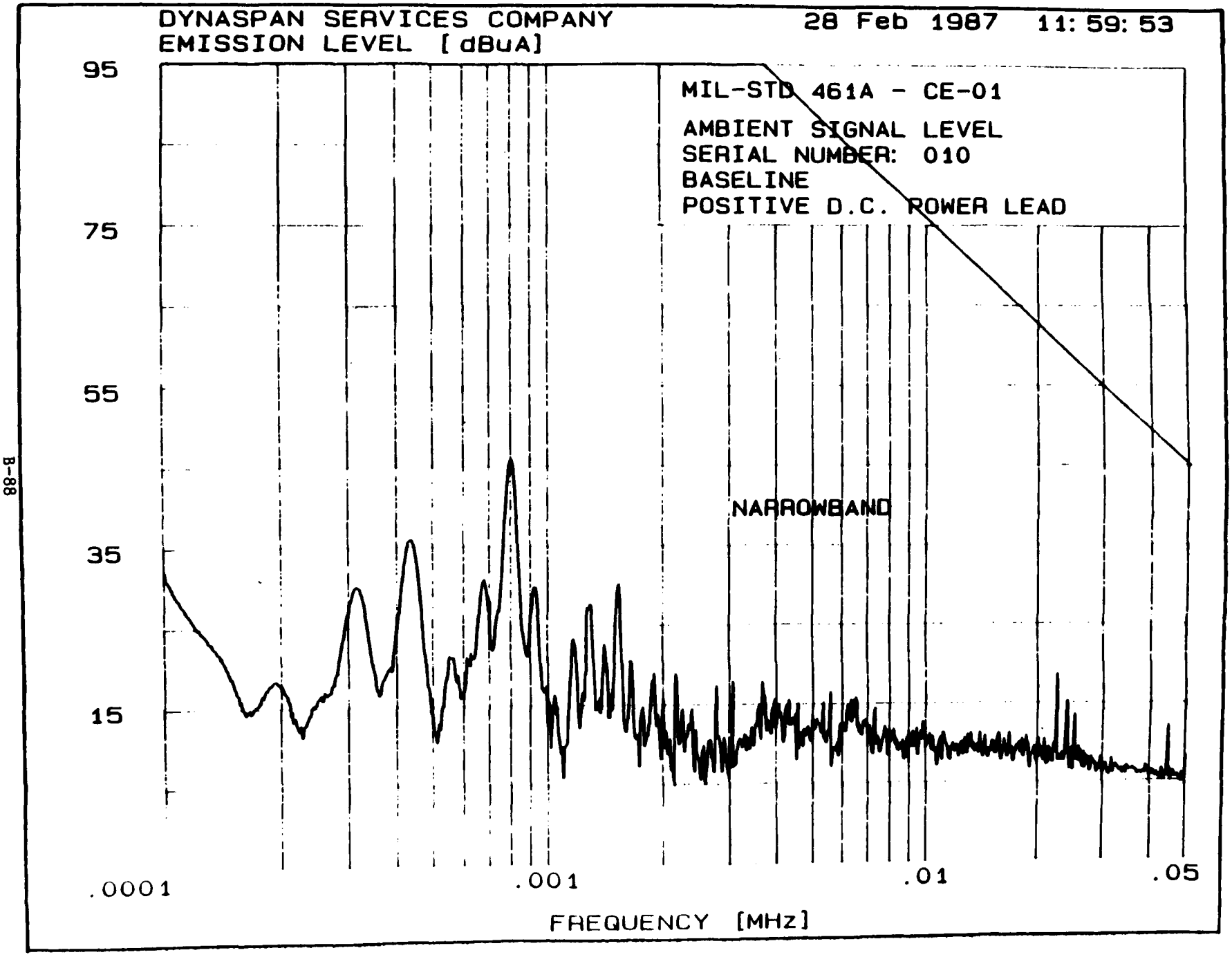
FIGURE 1


DYNASPAN SERVICES COMPANY
28 Feb 1987 11:45:25
EMISSION LEVEL [dBuA]
MIL-STD 461A - CE-01
MAGNAVOX LINEAR RESONANT COOLER
SERIAL NUMBER: 010
UNIT ENERGIZED (15 MIN WARM-UP)
POSITIVE D.C. POWER LEAD
NARROWBAND
95
75
55
35
15
.0001
.001
.01
.05
FREQUENCY [MHz]
98-86

FIGUF 2.


DYNASPAN SERVICES COMPANY
28 Feb 1987 11:05:07
EMISSION LEVEL [dBuA]
MIL-STD 461A - CE-01
MAGNAVOX LINEAR RESONANT COOLER
SERIAL NUMBER: 010
UNIT ENERGIZED (15 MIN WARM-UP)
NEGATIVE D.C. POWER LEAD
NARROWBAND
95
75
55
35
15
.0001
.001
.01
.05
FREQUENCY [MHz]

FIGLE 3.


DYNASPAN SERVICES COMPANY
28 Feb 1987 11:59:53
EMISSION LEVEL [dBuA]
MIL-STD 461A - CE-01
AMBIENT SIGNAL LEVEL
SERIAL NUMBER: 010
BASELINE
POSITIVE D.C. POWER LEAD
NARROWBAND
95
75
55
35
15
.0001
.001
.01
.05
FREQUENCY [MHz]

FIGUF 4.

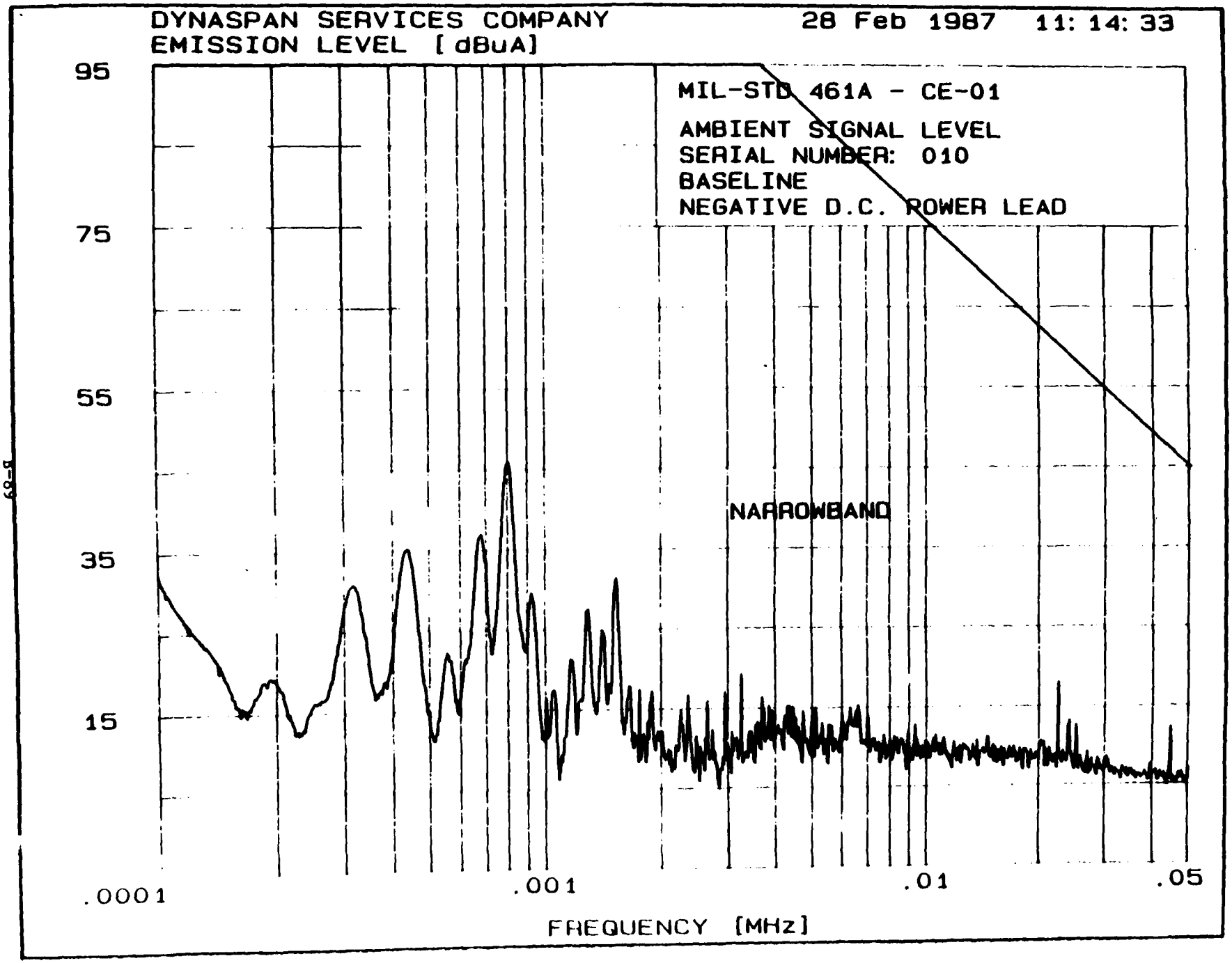
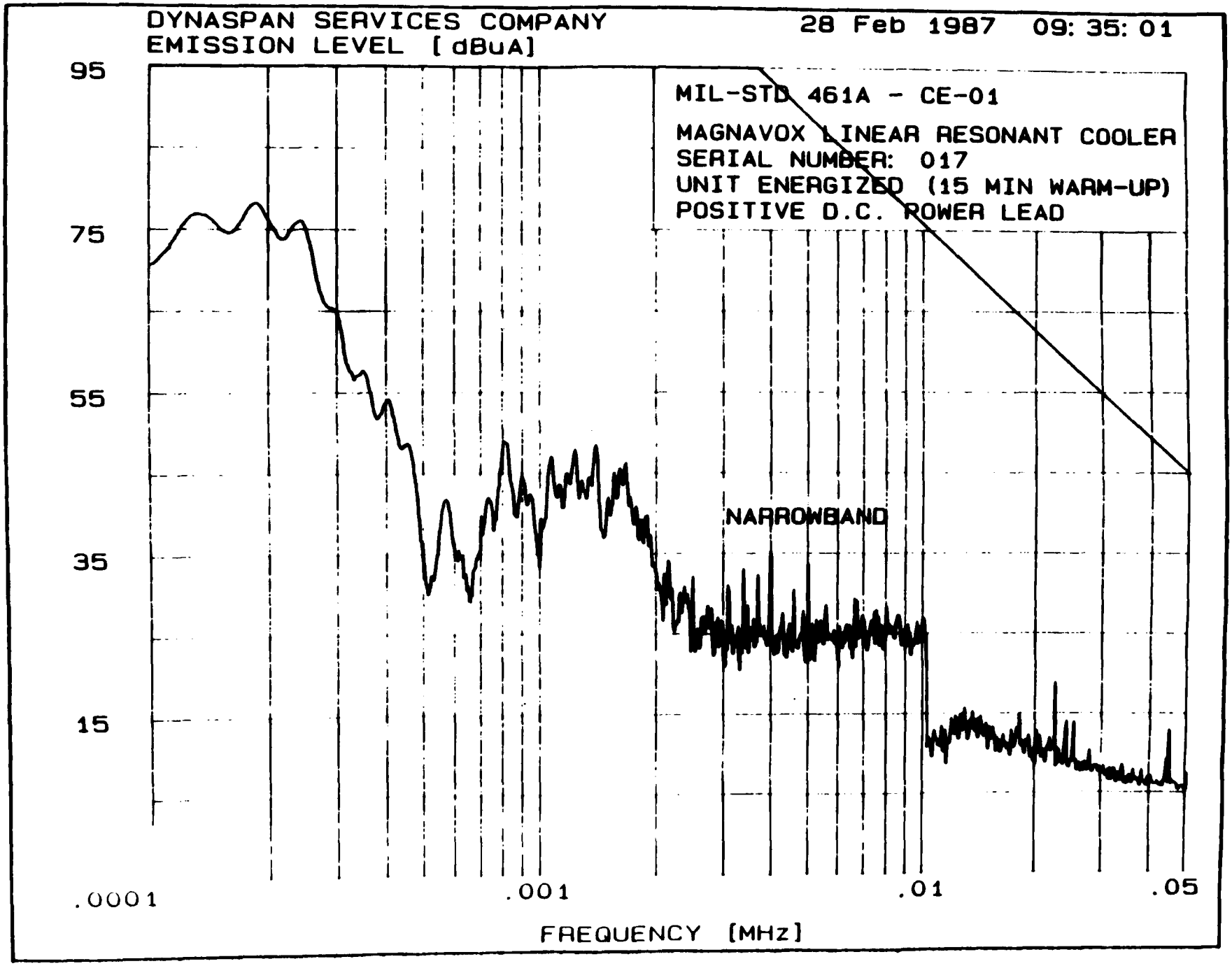

DYNASPAN SERVICES COMPANY
28 Feb 1987 11: 14: 33
EMISSION LEVEL [dBuA]
95
75
55
35
15
MIL-STD 461A - CE-01
AMBIENT SIGNAL LEVEL
SERIAL NUMBER: 010
BASELINE
NEGATIVE D.C. POWER LEAD
NARROWBAND
.0001
.001
.01
.05
FREQUENCY [MHz]

FIGURE 5.


DYNASPAN SERVICES COMPANY
28 Feb 1987 09: 35: 01
EMISSION LEVEL [dBuA]
MIL-STD 461A - CE-01
MAGNAVOX LINEAR RESONANT COOLER
SERIAL NUMBER: 017
UNIT ENERGIZED (15 MIN WARM-UP)
POSITIVE D.C. POWER LEAD
NARROWBAND
95
75
55
35
15
.0001
.001
.01
.05
FREQUENCY [MHz]

FIGU E 6.

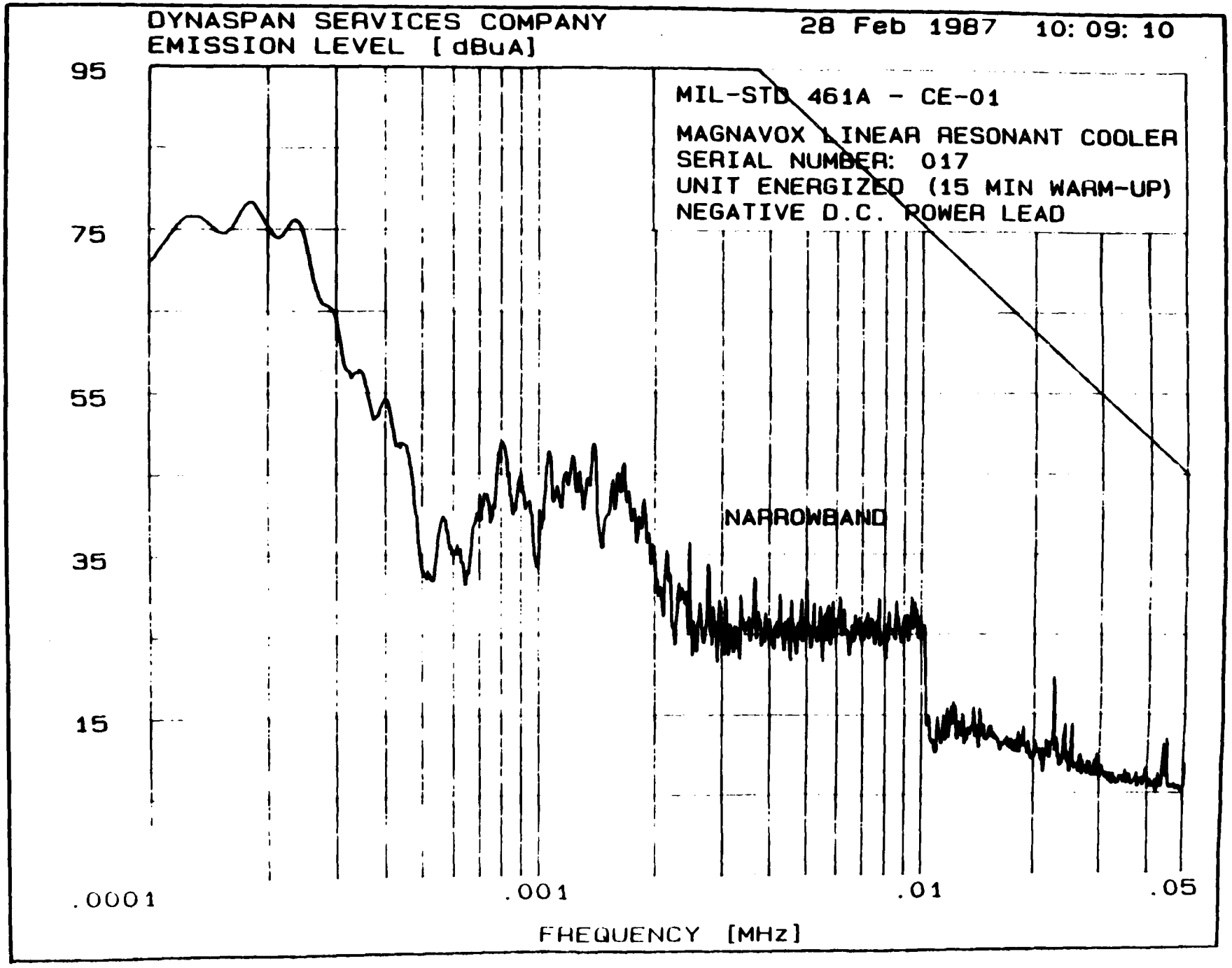
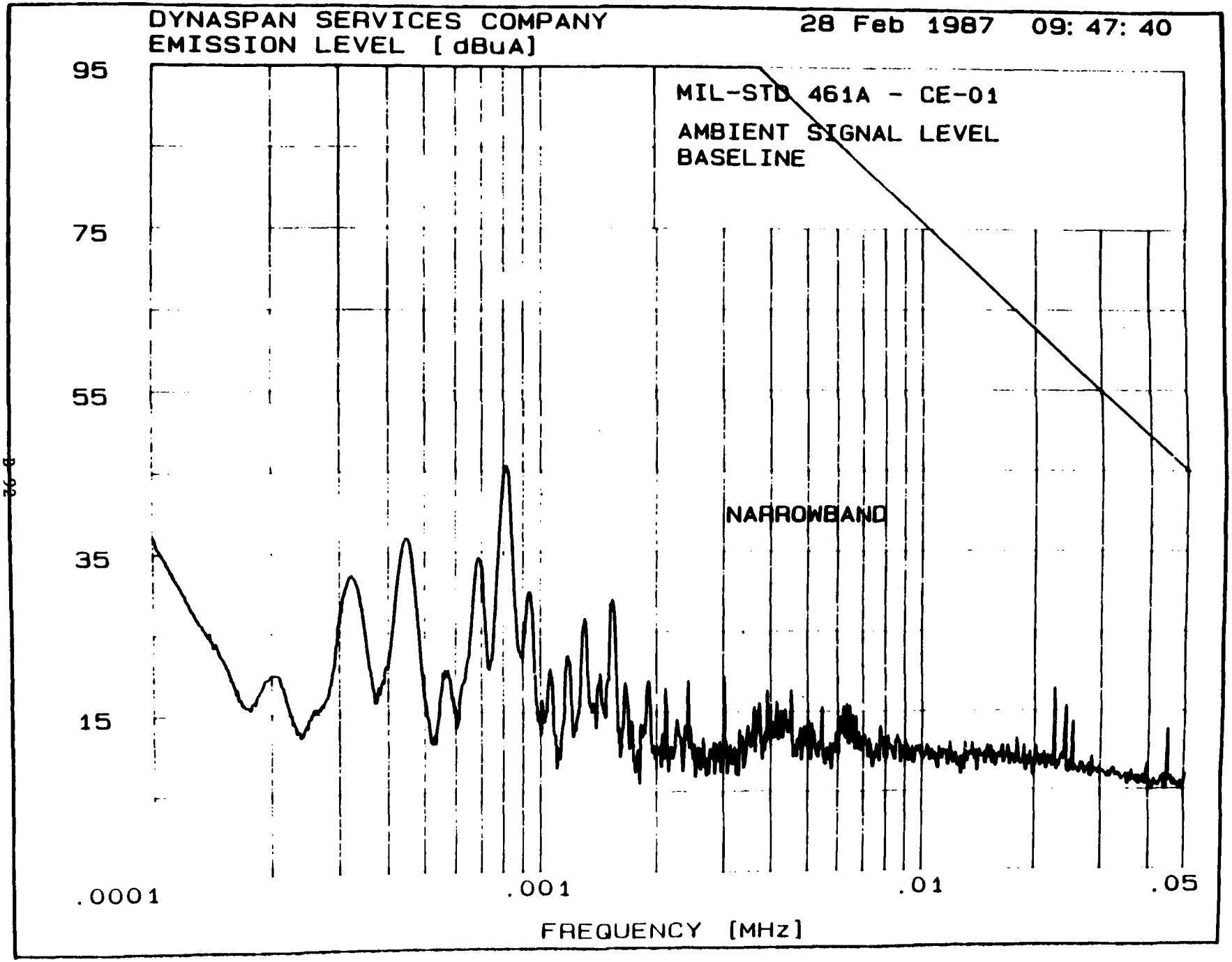

DYNASPAN SERVICES COMPANY
28 Feb 1987 10:09:10
EMISSION LEVEL [dBuA]
MIL-STD 461A - CE-01
MAGNAVOX LINEAR RESONANT COOLER
SERIAL NUMBER: 017
UNIT ENERGIZED (15 MIN WARM-UP)
NEGATIVE D.C. POWER LEAD
NARROWBAND
95
75
55
35
15
.0001
.001
.01
.05
FREQUENCY [MHz]

FIGURE 7.


DYNASPAN SERVICES COMPANY
28 Feb 1987 09: 47: 40
EMISSION LEVEL [dBuA]
95
75
55
35
15
MIL-STD 461A - CE-01
AMBIENT SIGNAL LEVEL
BASELINE
NARROWBAND
.0001
.001
.01
.05
FREQUENCY [MHz]

FIGUR 8.

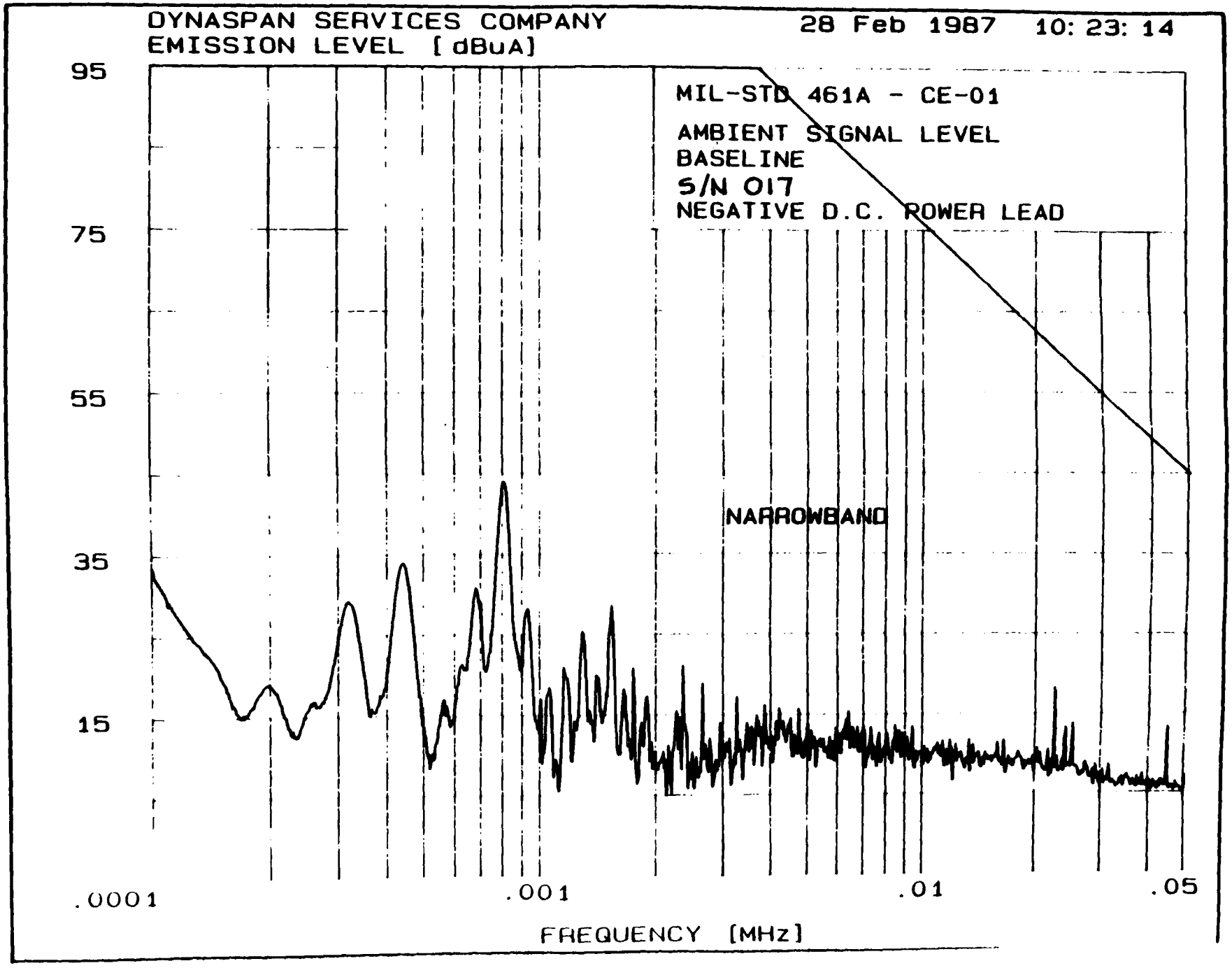
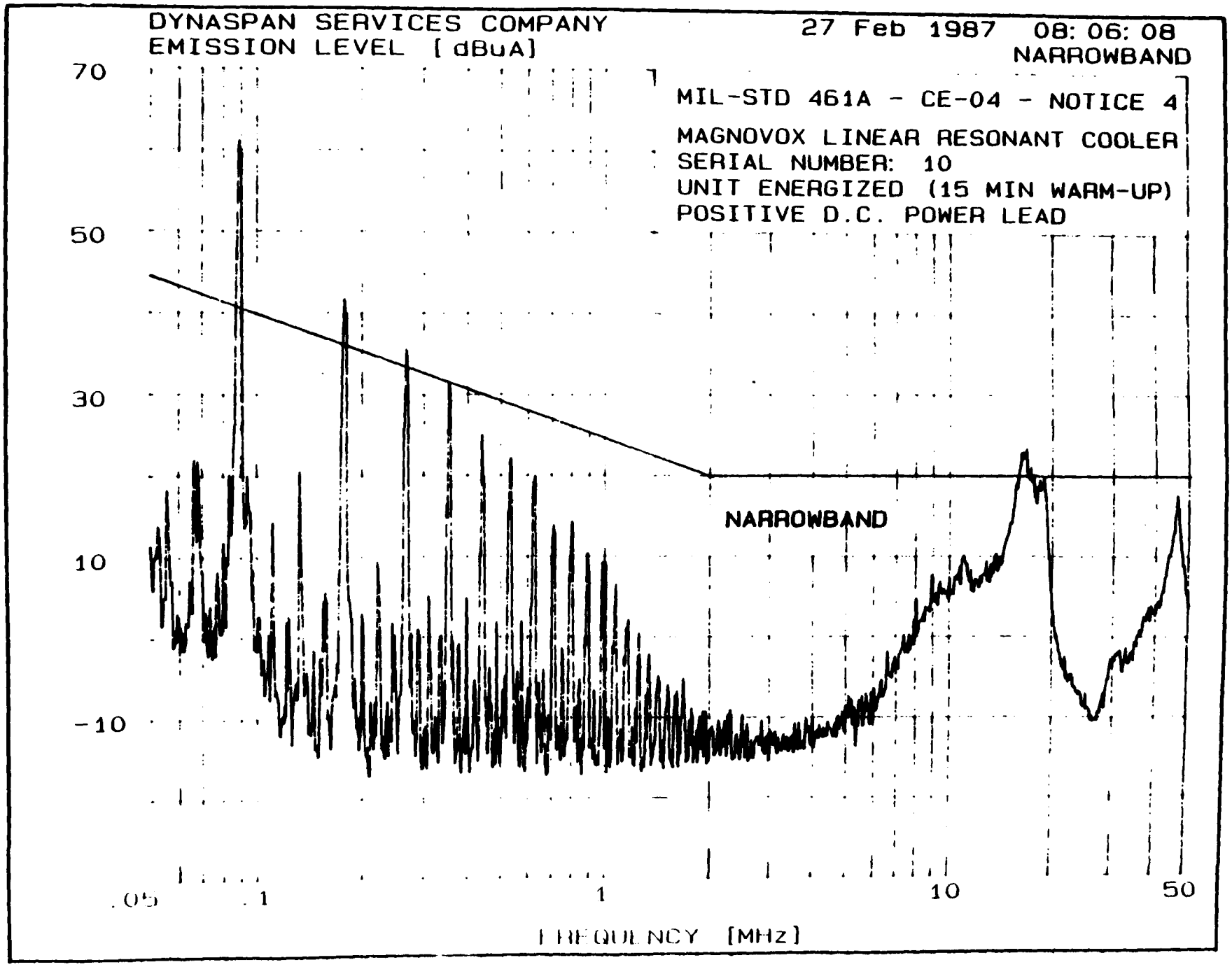

DYNASPAN SERVICES COMPANY
28 Feb 1987 10: 23: 14
EMISSION LEVEL [dBuA]
MIL-STD 461A - CE-01
AMBIENT SIGNAL LEVEL
BASELINE
S/N 017
NEGATIVE D.C. POWER LEAD
NARROWBAND
95
75
55
35
15
.0001
.001
.01
.05
FREQUENCY [MHz]

FIGURE 9


DYNASPAN SERVICES COMPANY
EMISSION LEVEL [dBuA]
27 Feb 1987 08:06:08
NARROWBAND
MIL-STD 461A - CE-04 - NOTICE 4
MAGNOVOX LINEAR RESONANT COOLER
SERIAL NUMBER: 10
UNIT ENERGIZED (15 MIN WARM-UP)
POSITIVE D.C. POWER LEAD
70
50
30
10
-10
NARROWBAND
.05
.1
1
10
50
FREQUENCY [MHz]

FIGUR 10.

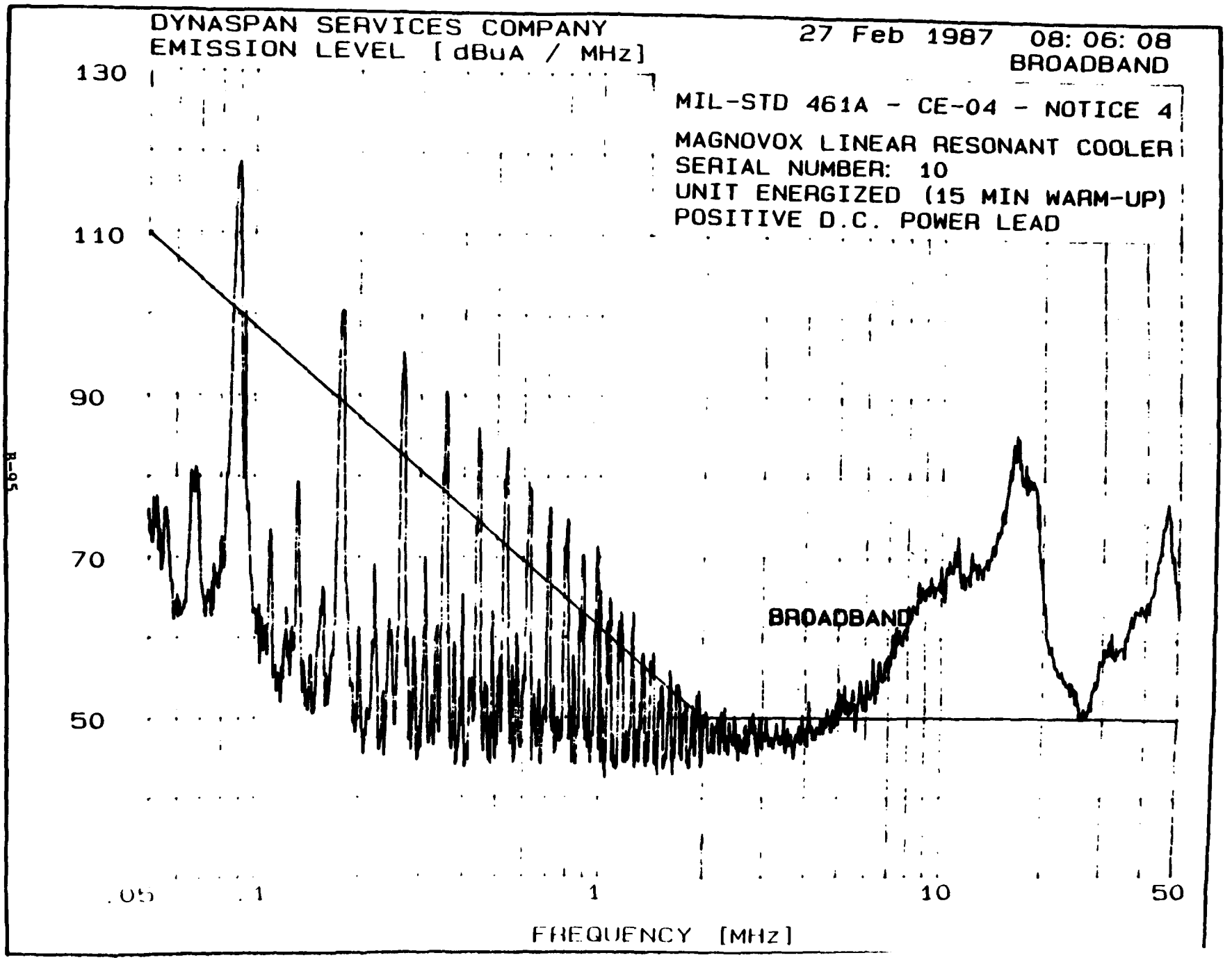

DYNASPAN SERVICES COMPANY
EMISSION LEVEL [dBuA / MHz]
27 Feb 1987 08:06:08
BROADBAND
MIL-STD 461A - CE-04 - NOTICE 4
MAGNOVOX LINEAR RESONANT COOLER
SERIAL NUMBER: 10
UNIT ENERGIZED (15 MIN WARM-UP)
POSITIVE D.C. POWER LEAD
130
110
90
70
50
R-95
BROADBAND
.05
.1
1
10
50
FREQUENCY [MHz]

FIGURE 11.

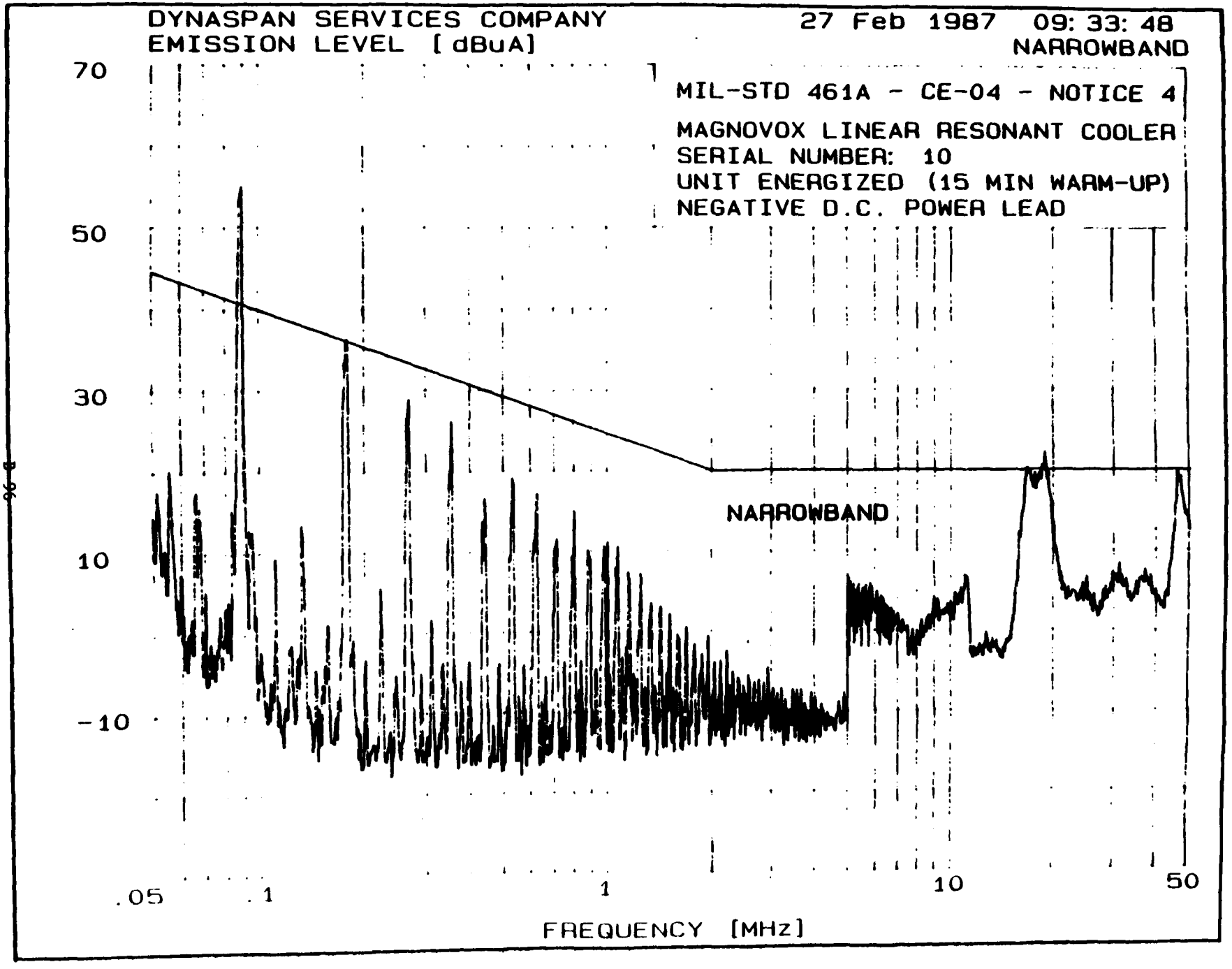

DYNASPAN SERVICES COMPANY
27 Feb 1987 09: 33: 48
EMISSION LEVEL [dBuA]
NARROWBAND
MIL-STD 461A - CE-04 - NOTICE 4
MAGNOVOX LINEAR RESONANT COOLER
SERIAL NUMBER: 10
UNIT ENERGIZED (15 MIN WARM-UP)
NEGATIVE D.C. POWER LEAD
70
50
30
10
-10
NARROWBAND
.05
.1
1
10
50
FREQUENCY [MHz]

FIGURE 12

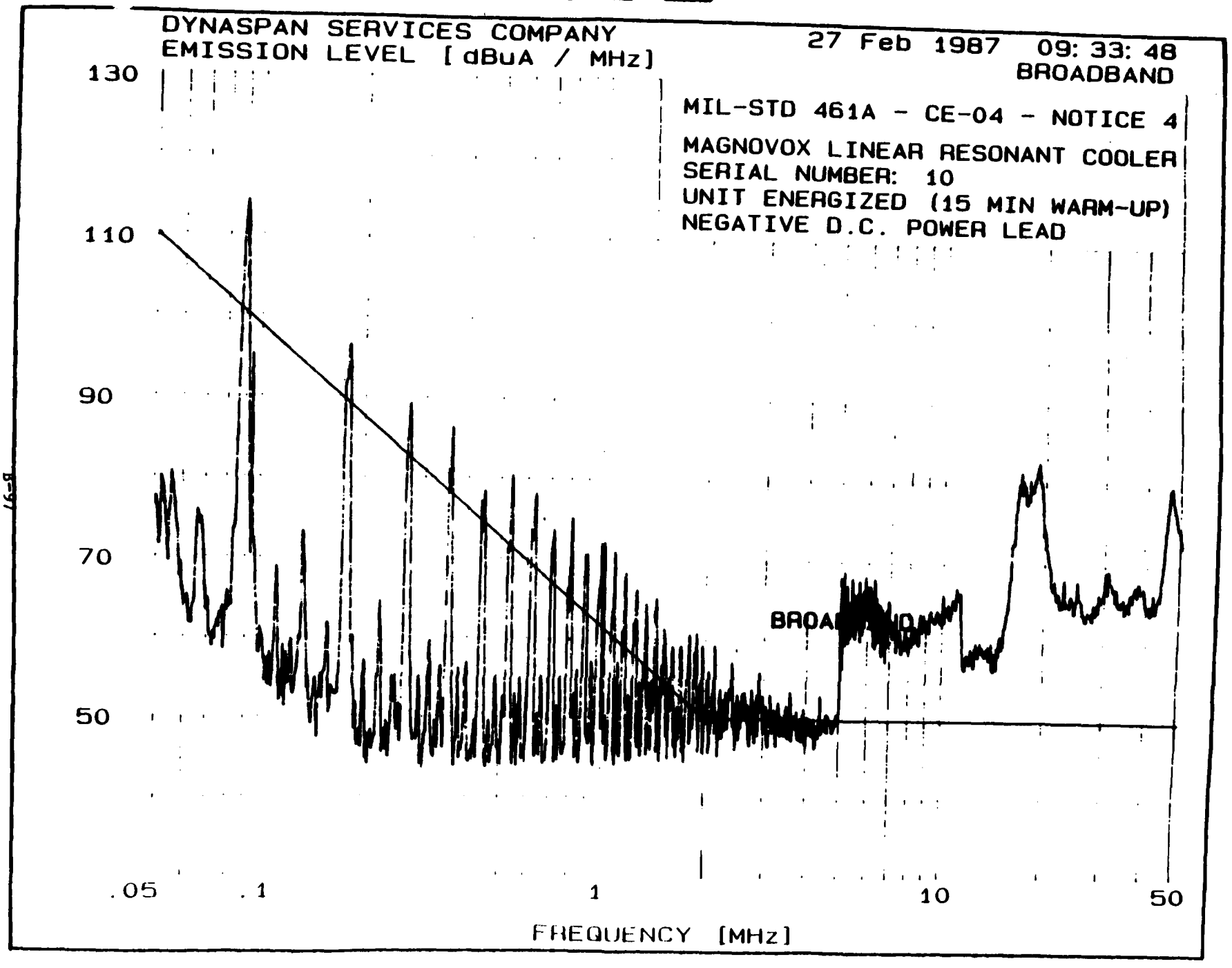

DYNASPAN SERVICES COMPANY
EMISSION LEVEL [dBuA / MHz]
27 Feb 1987 09: 33: 48
BROADBAND
MIL-STD 461A - CE-04 - NOTICE 4
MAGNOVOX LINEAR RESONANT COOLER
SERIAL NUMBER: 10
UNIT ENERGIZED (15 MIN WARM-UP)
NEGATIVE D.C. POWER LEAD
130
110
90
70
50
.05
.1
1
10
50
FREQUENCY [MHz]

FIGURE 13

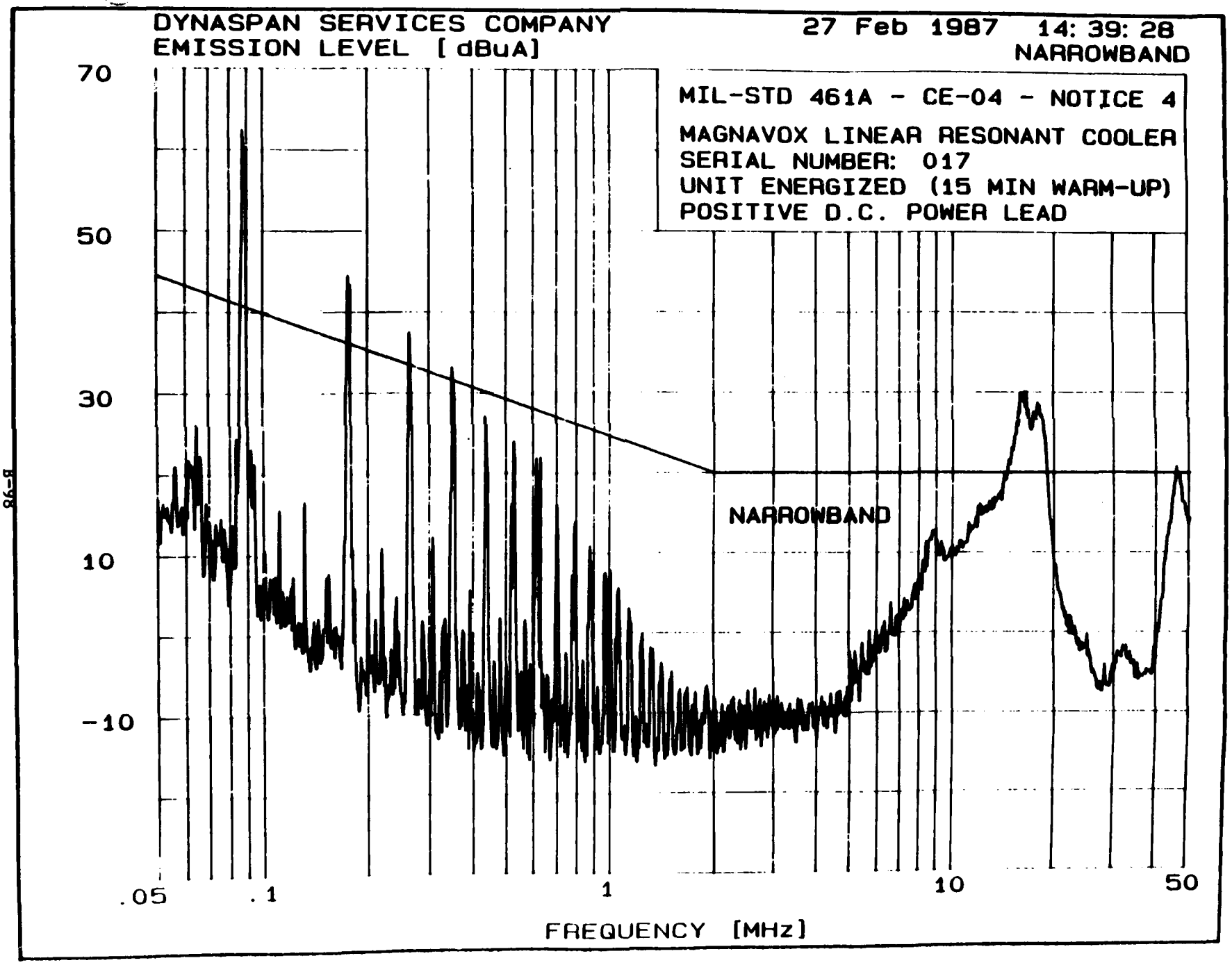

DYNASPAN SERVICES COMPANY
27 Feb 1987 14: 39: 28
EMISSION LEVEL [dBuA]
NARROWBAND
MIL-STD 461A - CE-04 - NOTICE 4
MAGNAVOX LINEAR RESONANT COOLER
SERIAL NUMBER: 017
UNIT ENERGIZED (15 MIN WARM-UP)
POSITIVE D.C. POWER LEAD
NARROWBAND
70
50
30
10
-10
.05
.1
1
10
50
FREQUENCY [MHz]
86-98

FIGURE 4.

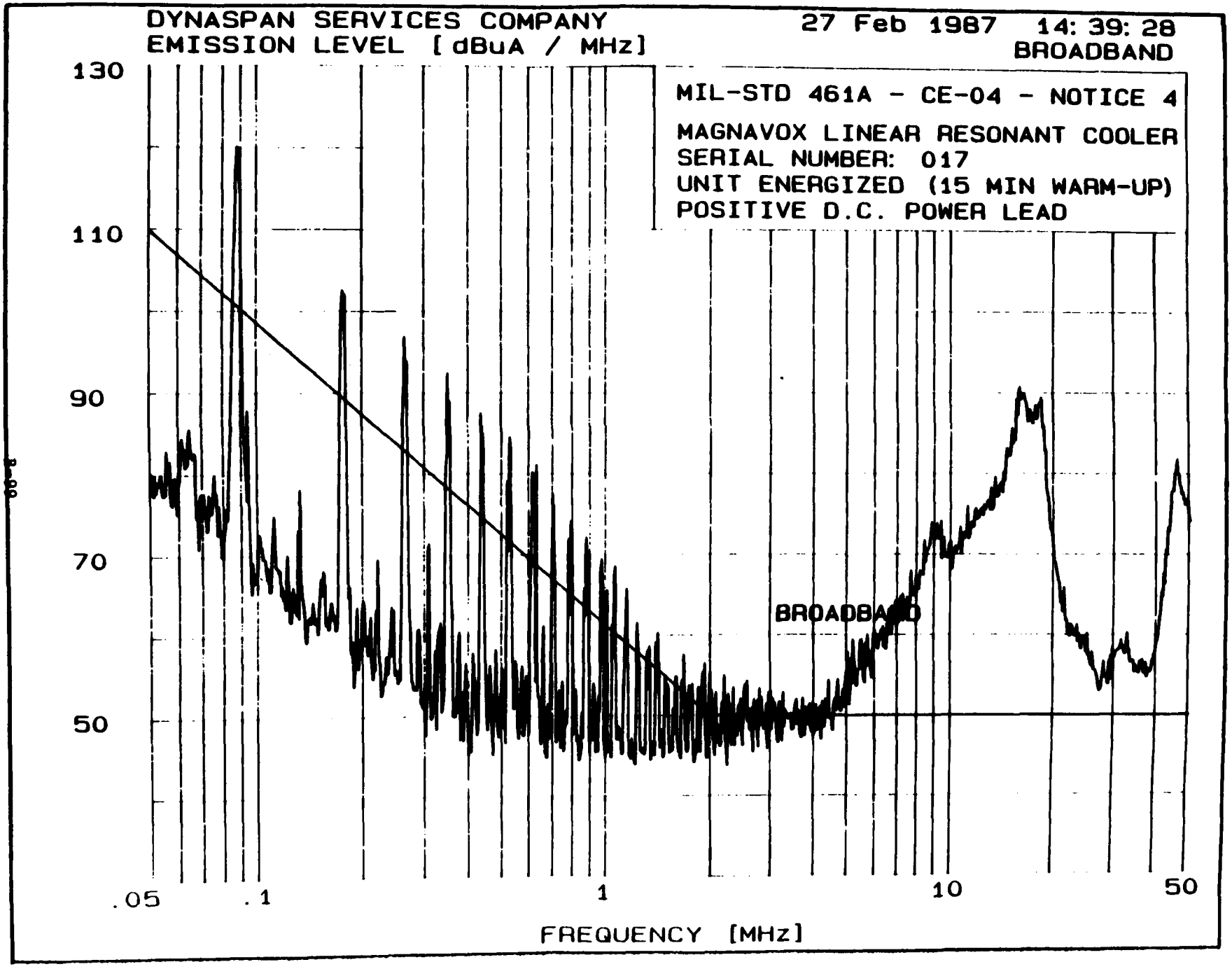

DYNASPAN SERVICES COMPANY
EMISSION LEVEL [dBuA / MHz]
27 Feb 1987 14:39:28
BROADBAND
MIL-STD 461A - CE-04 - NOTICE 4
MAGNAVOX LINEAR RESONANT COOLER
SERIAL NUMBER: 017
UNIT ENERGIZED (15 MIN WARM-UP)
POSITIVE D.C. POWER LEAD
130
110
90
70
50
BROADBAND
.05
.1
1
10
50
FREQUENCY [MHz]

FIGURE 15.

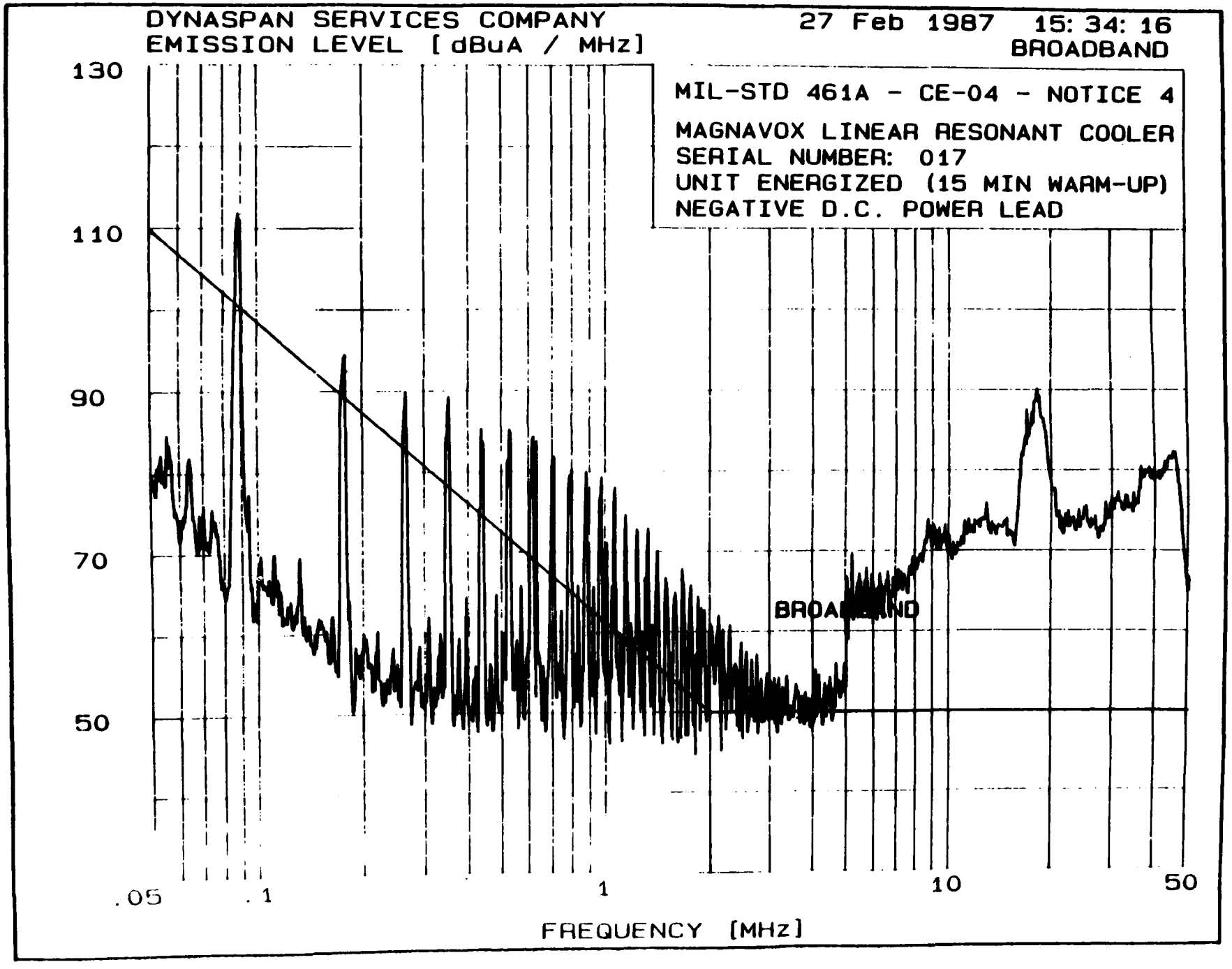

DYNASPAN SERVICES COMPANY
EMISSION LEVEL [dBuA / MHz]
27 Feb 1987 15:34:16
BROADBAND
MIL-STD 461A - CE-04 - NOTICE 4
MAGNAVOX LINEAR RESONANT COOLER
SERIAL NUMBER: 017
UNIT ENERGIZED (15 MIN WARM-UP)
NEGATIVE D.C. POWER LEAD
130
110
90
70
50
BROADBAND
.05
.1
1
10
50
FREQUENCY [MHz]
B-100

FIGURE 16.

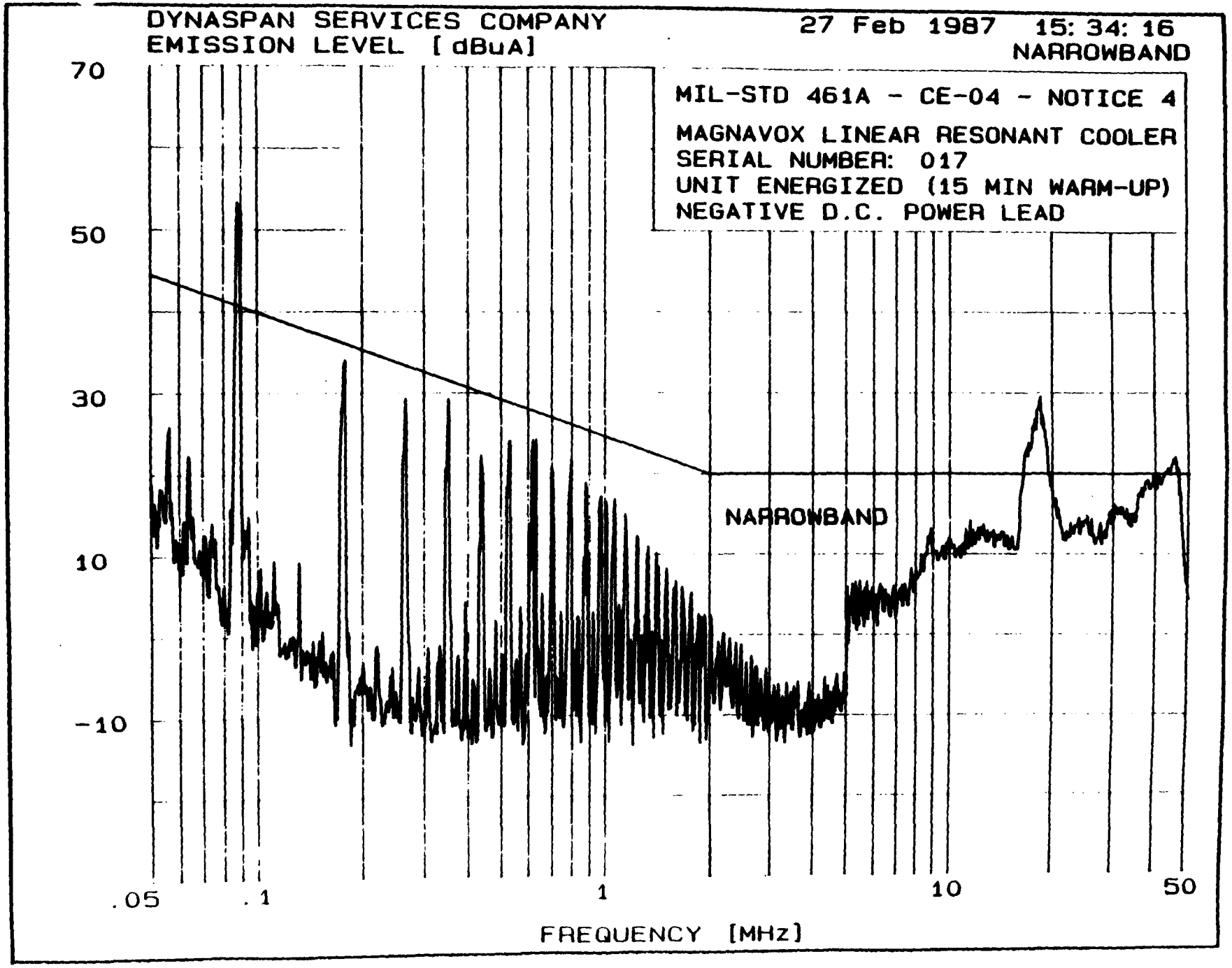
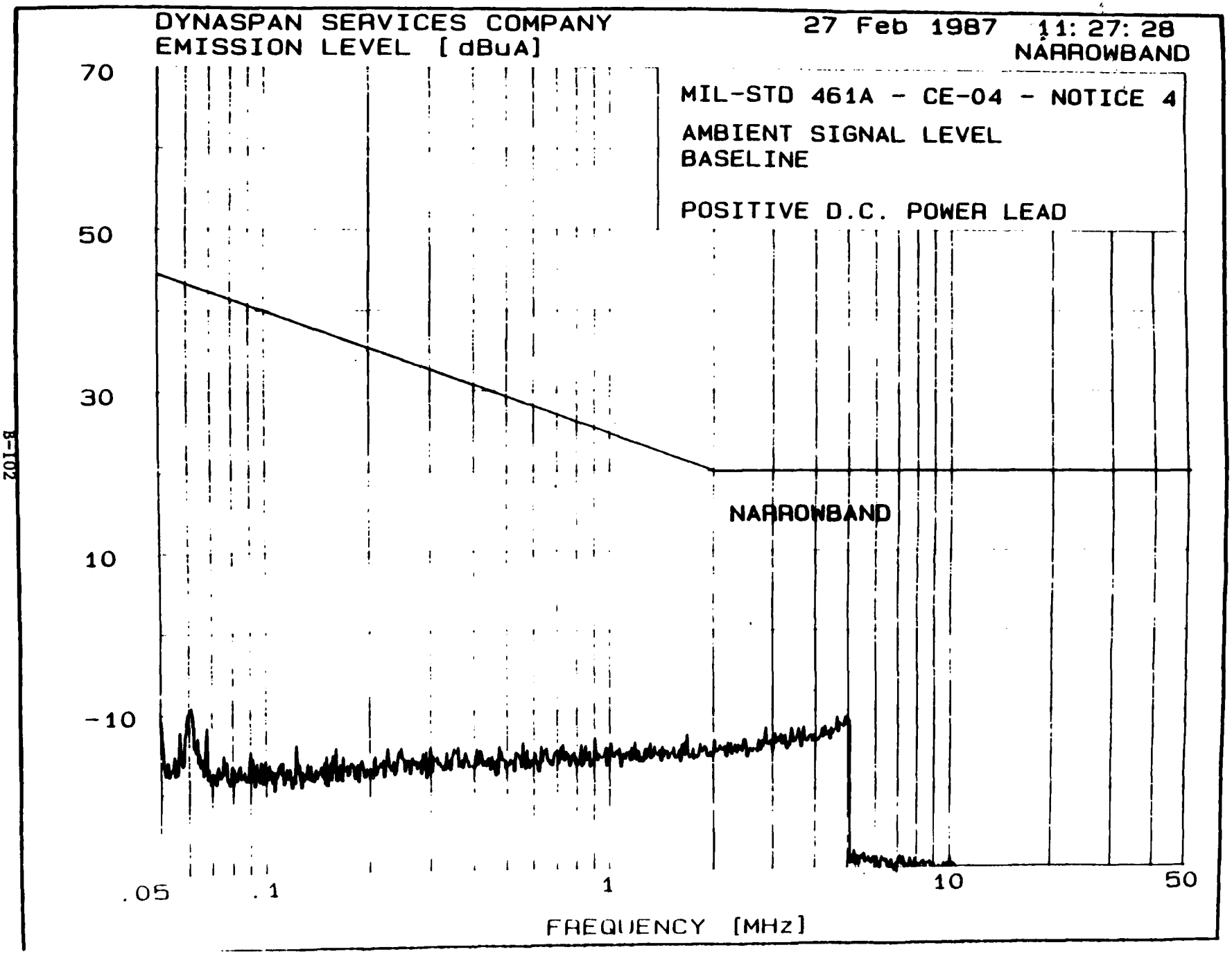
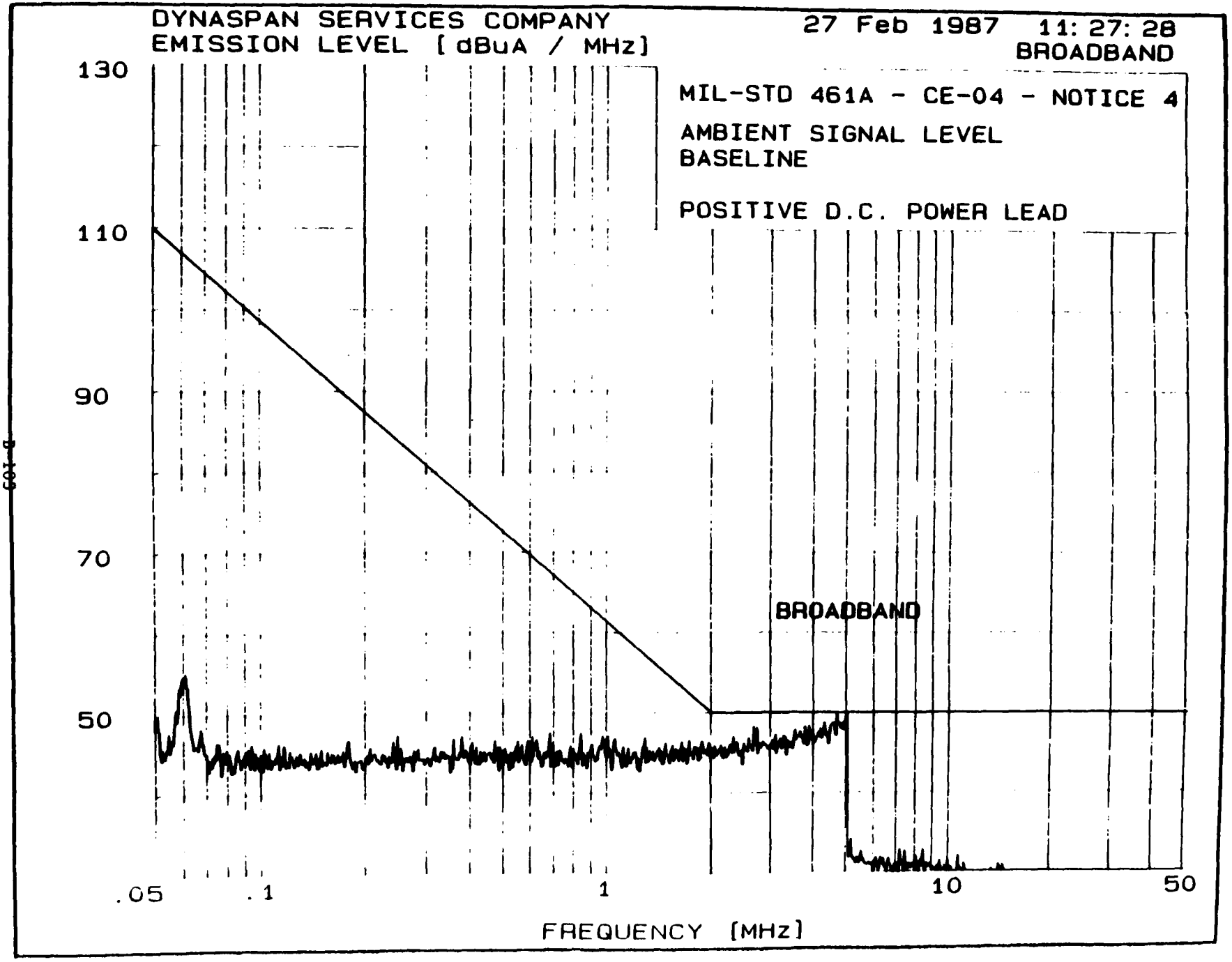

DYNASPAN SERVICES COMPANY
EMISSION LEVEL [dBuA]
27 Feb 1987 15:34:16
NARROWBAND
MIL-STD 461A - CE-04 - NOTICE 4
MAGNAVOX LINEAR RESONANT COOLER
SERIAL NUMBER: 017
UNIT ENERGIZED (15 MIN WARM-UP)
NEGATIVE D.C. POWER LEAD
NARROWBAND
70
50
30
10
-10
.05
.1
1
10
50
FREQUENCY [MHz]

FIGURE 1.


DYNASPAN SERVICES COMPANY
EMISSION LEVEL [dBuA]
27 Feb 1987 11:27:28
NARROWBAND
MIL-STD 461A - CE-04 - NOTICE 4
AMBIENT SIGNAL LEVEL
BASELINE
POSITIVE D.C. POWER LEAD
NARROWBAND
70
50
30
10
-10
.05
.1
1
10
50
FREQUENCY [MHz]
B-102

FIGUR 18.


DYNASPAN SERVICES COMPANY
EMISSION LEVEL [dBuA / MHz]
27 Feb 1987 11:27:28
BROADBAND
MIL-STD 461A - CE-04 - NOTICE 4
AMBIENT SIGNAL LEVEL
BASELINE
POSITIVE D.C. POWER LEAD
130
110
90
70
50
BROADBAND
.05
.1
1
10
50
FREQUENCY [MHz]

FIGUR 19.

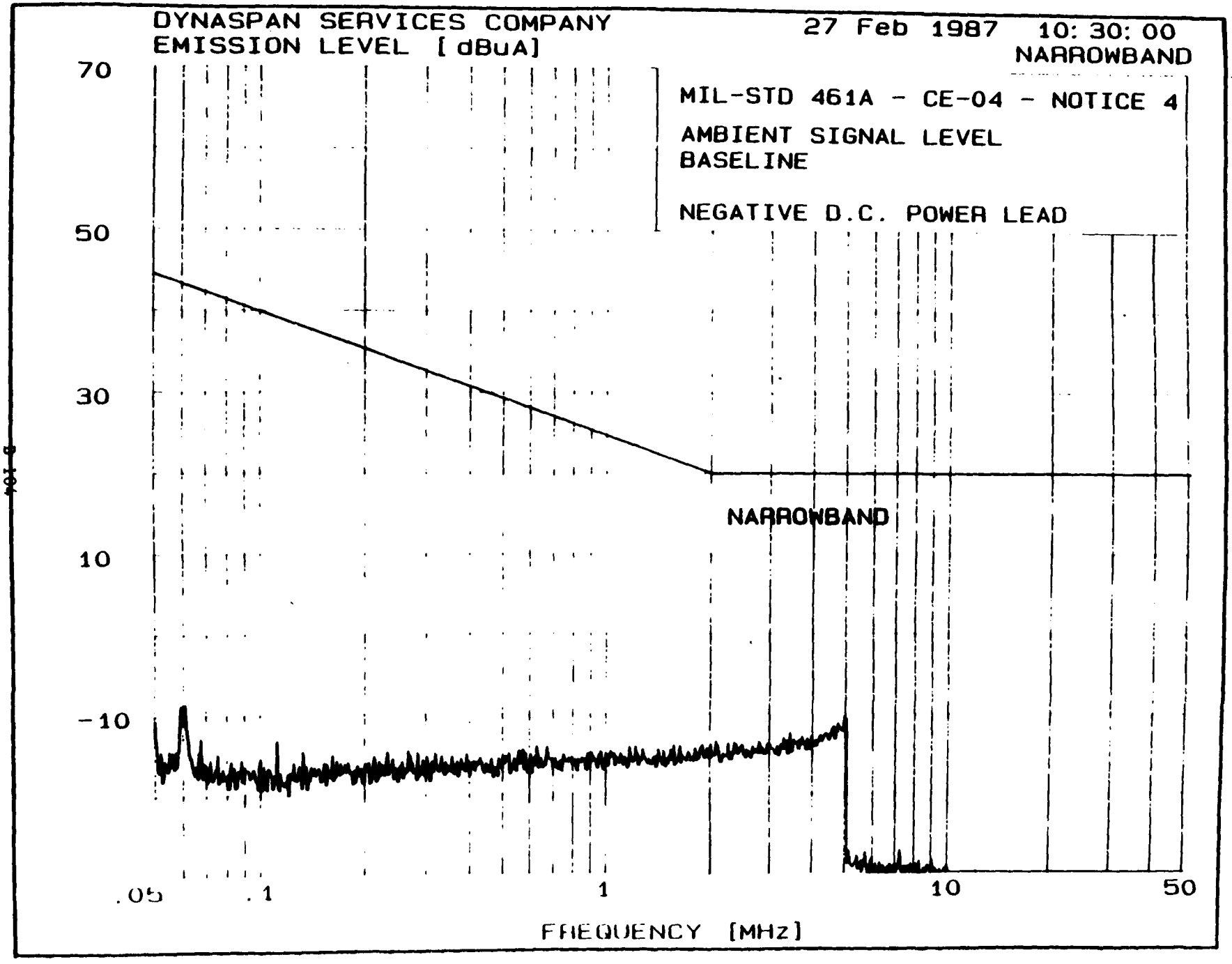
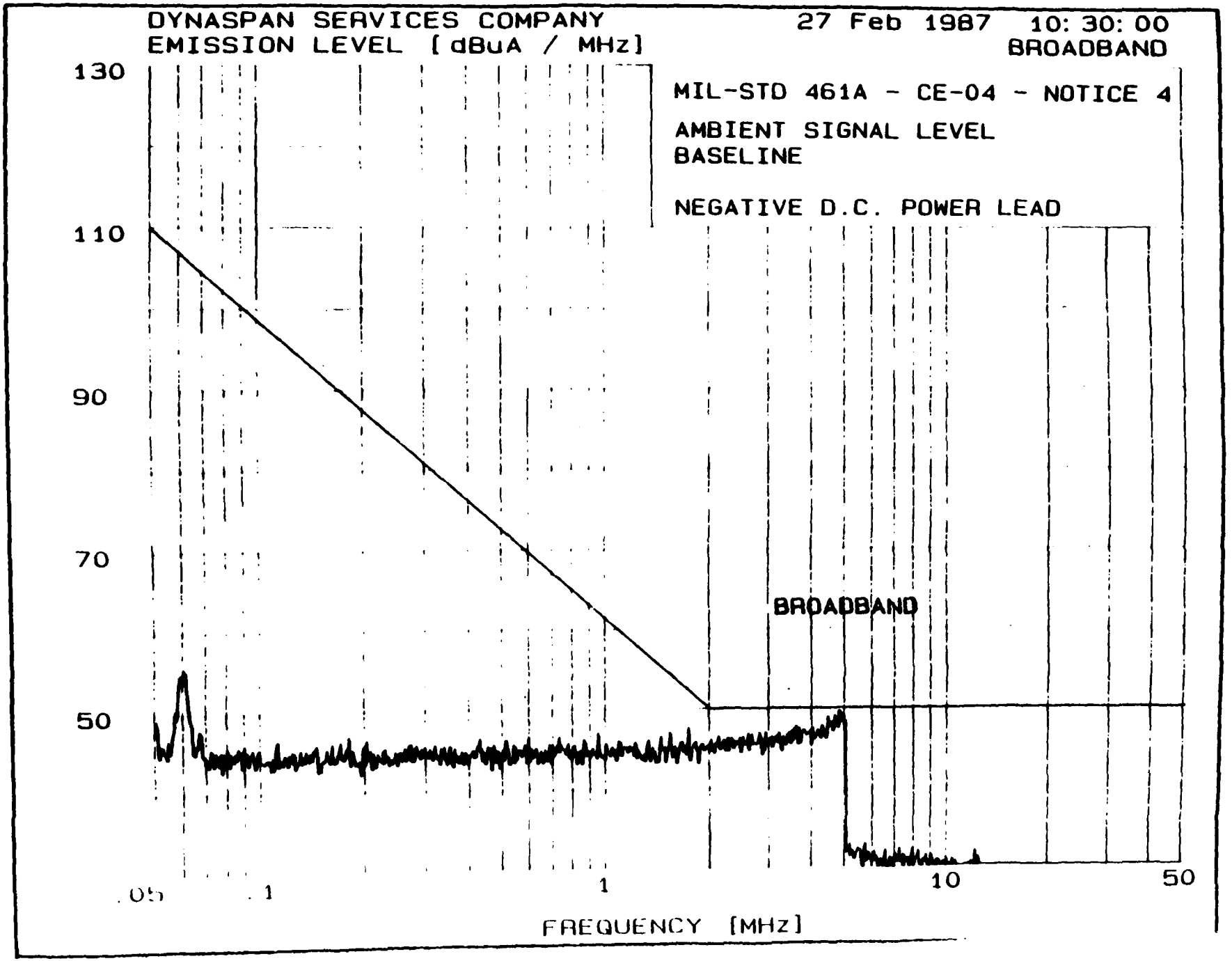

DYNASPAN SERVICES COMPANY
EMISSION LEVEL [dBuA]
27 Feb 1987 10:30:00
NARROWBAND
MIL-STD 461A - CE-04 - NOTICE 4
AMBIENT SIGNAL LEVEL
BASELINE
NEGATIVE D.C. POWER LEAD
70
50
30
10
-10
NARROWBAND
.05
.1
1
10
50
FREQUENCY [MHz]

FIGURE 20.


DYNASPAN SERVICES COMPANY
EMISSION LEVEL [dBuA / MHz]
27 Feb 1987 10:30:00
BROADBAND
MIL-STD 461A - CE-04 - NOTICE 4
AMBIENT SIGNAL LEVEL
BASELINE
NEGATIVE D.C. POWER LEAD
130
110
90
70
50
BROADBAND
.05
.1
1
10
50
FREQUENCY [MHz]

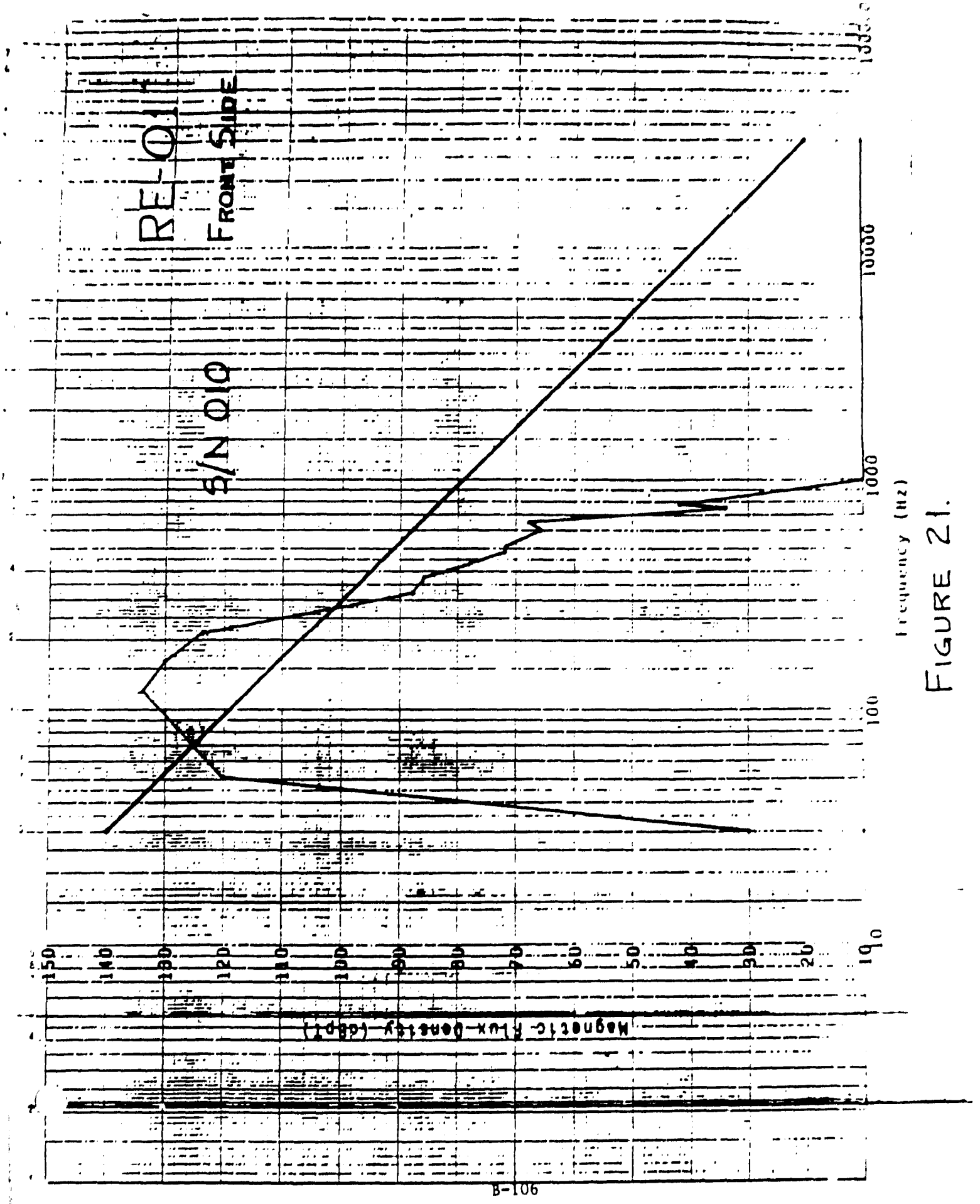


FIGURE 21.

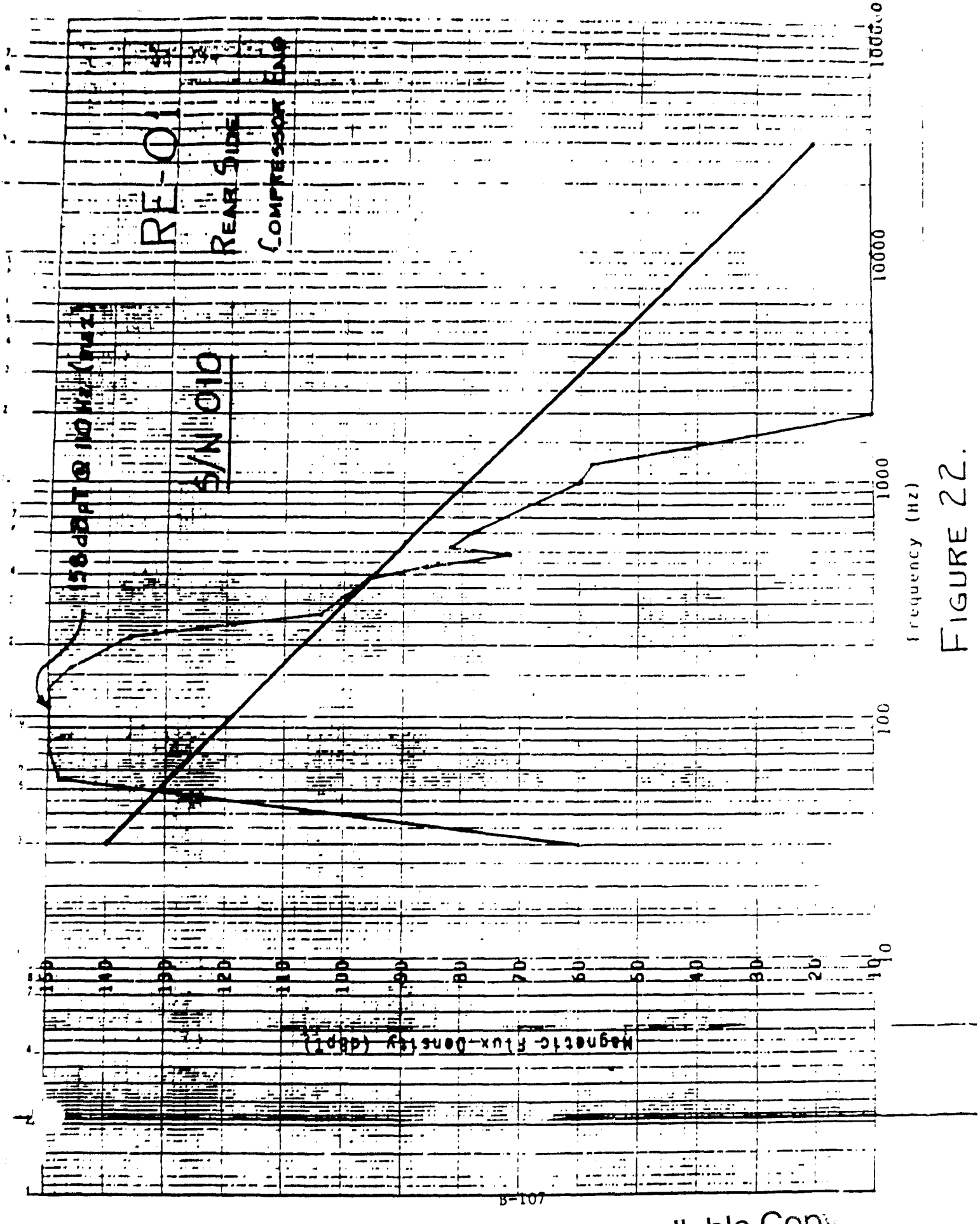


FIGURE 22.

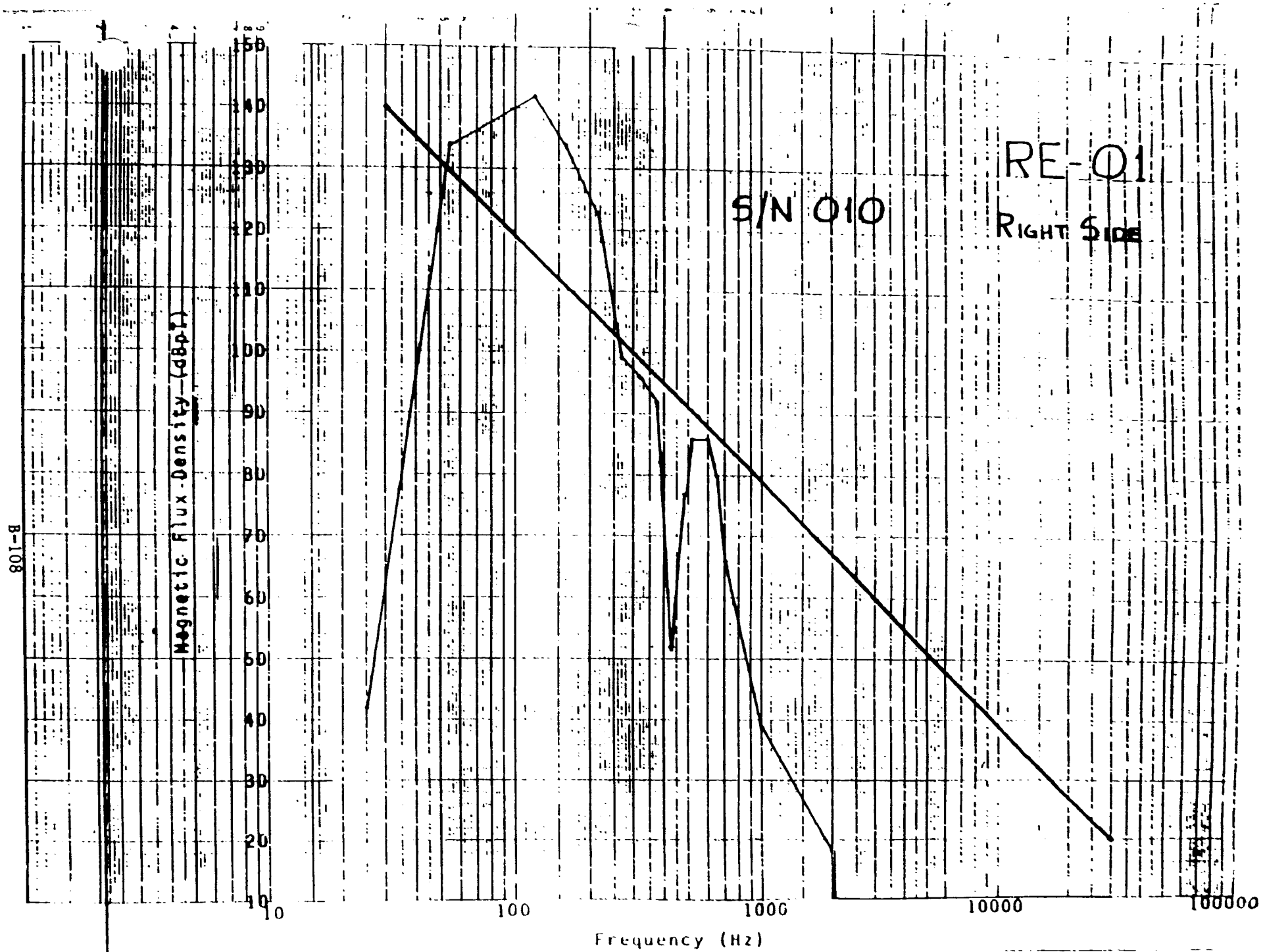


FIGURE 23.

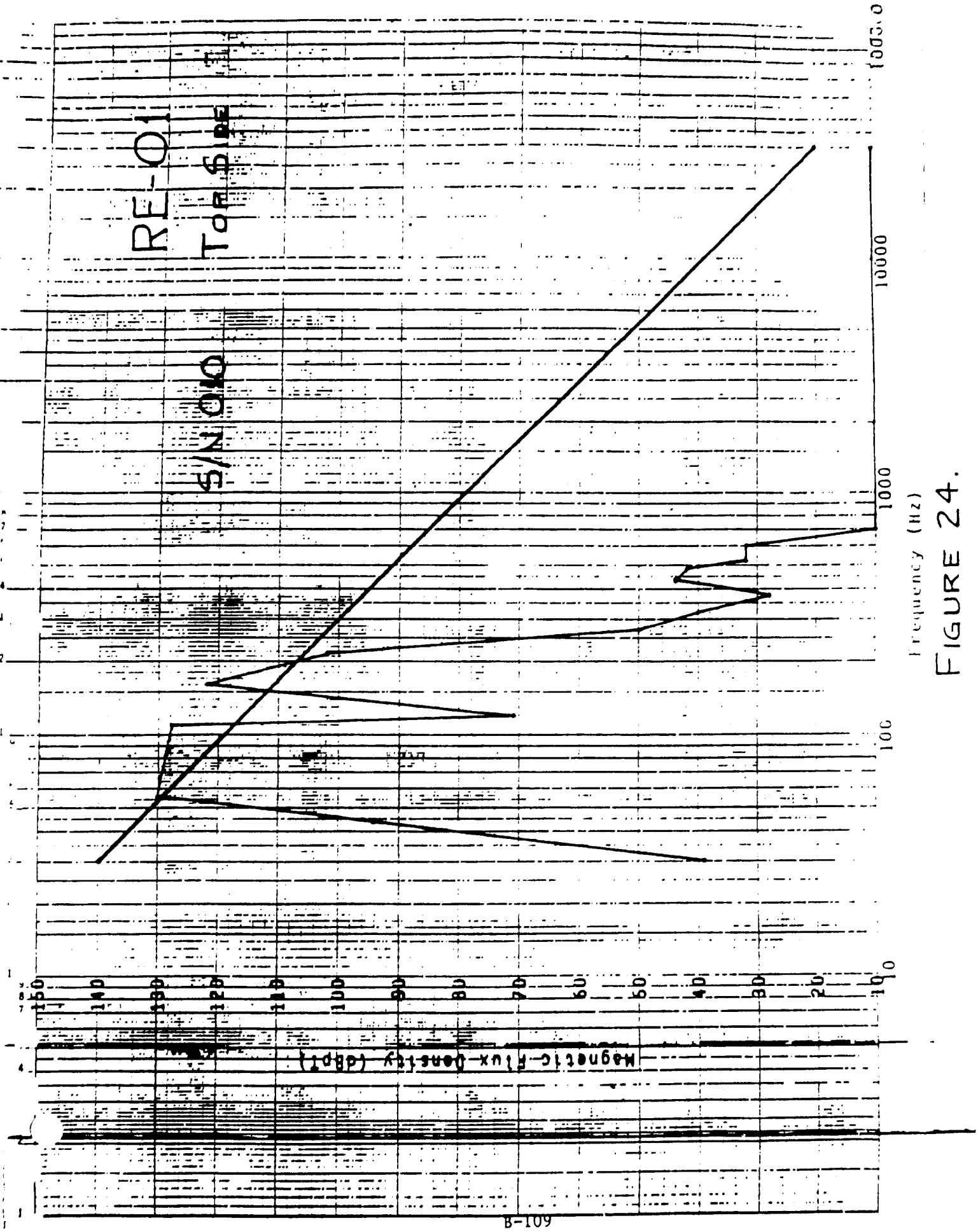


FIGURE 24.

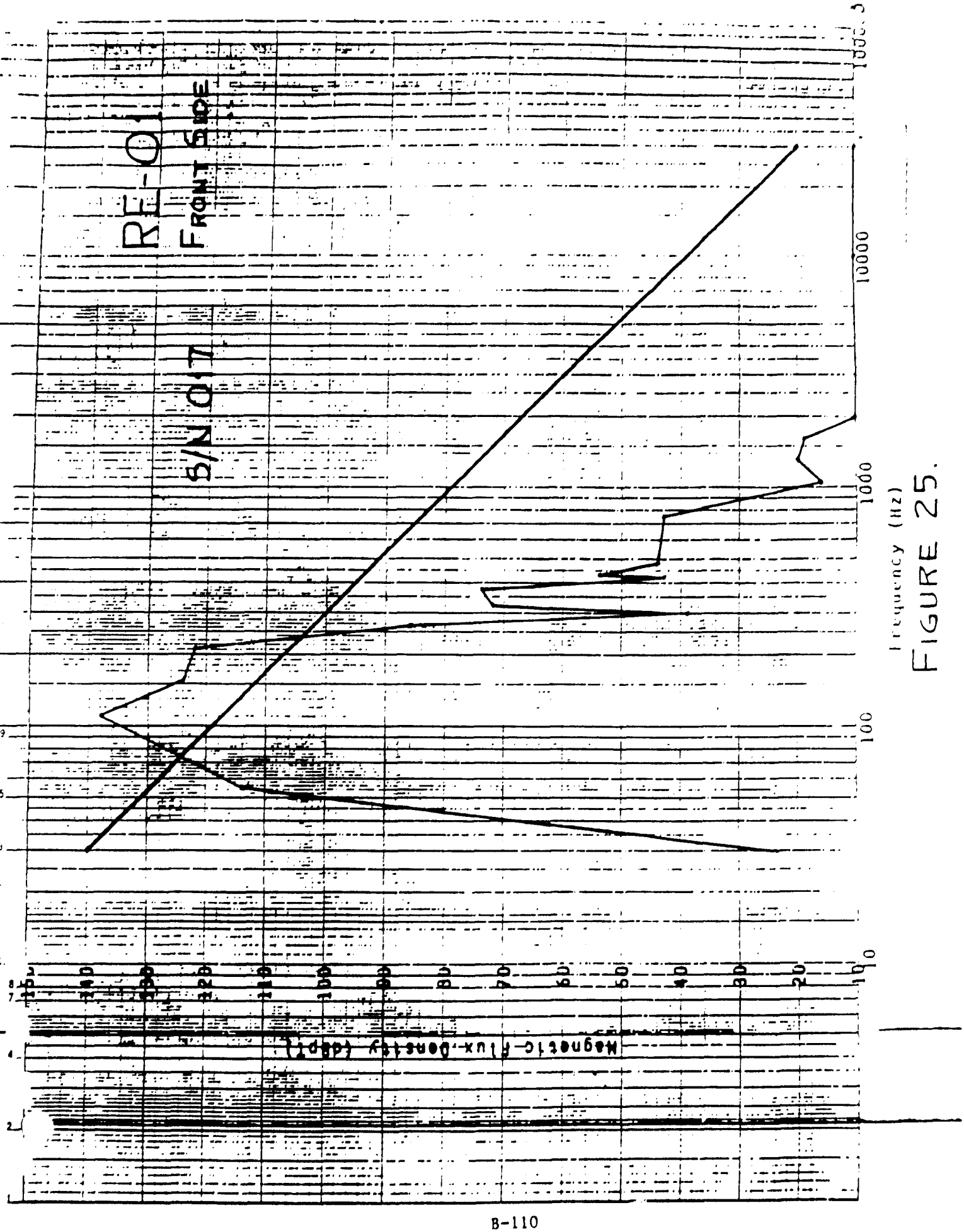


FIGURE 25.

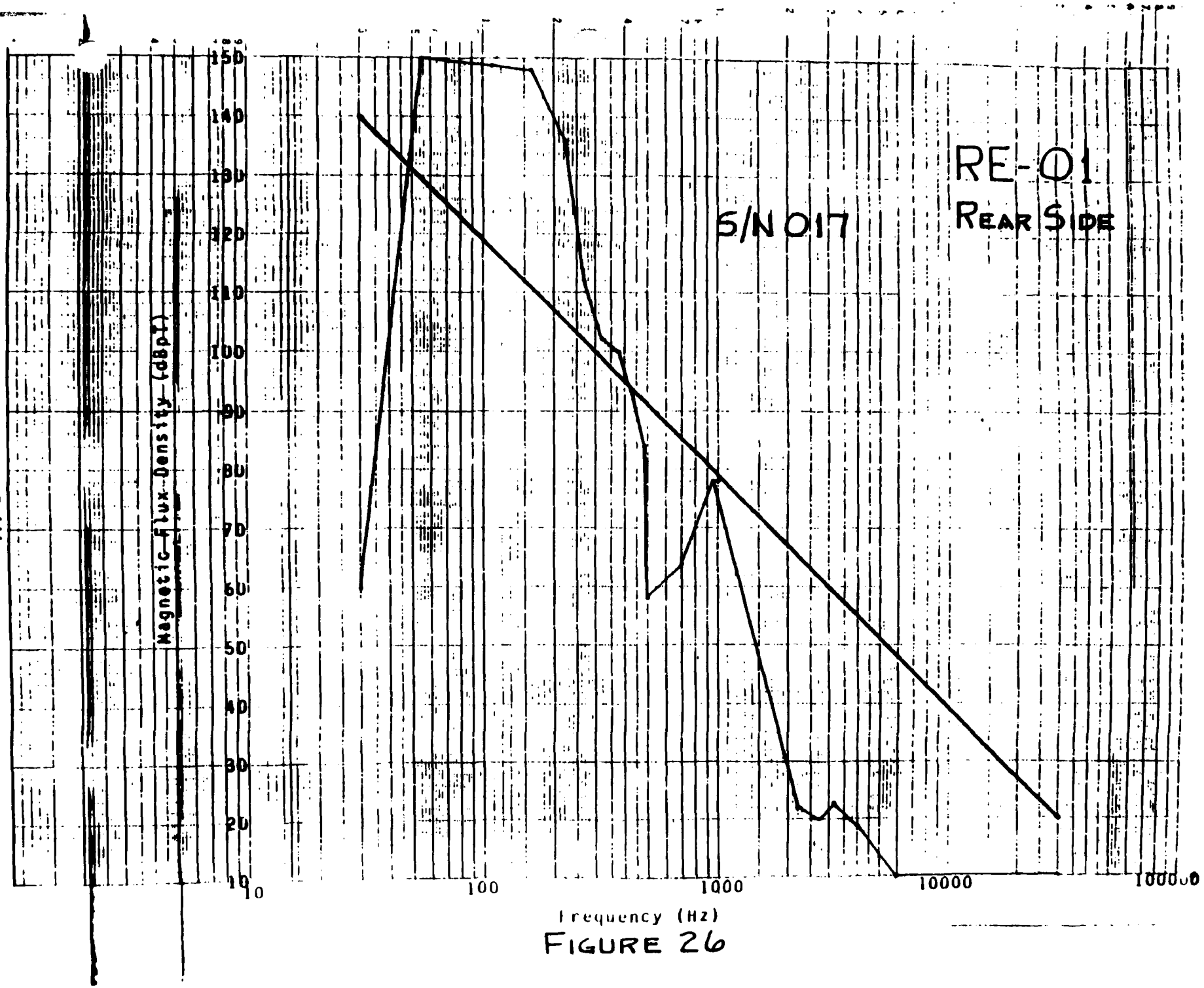

RE-01
REAR SIDE
S/N 017
Magnetic Flux Density (dBpT)
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
10
100
1000
10000
100000
Frequency (Hz)

FIGURE 26

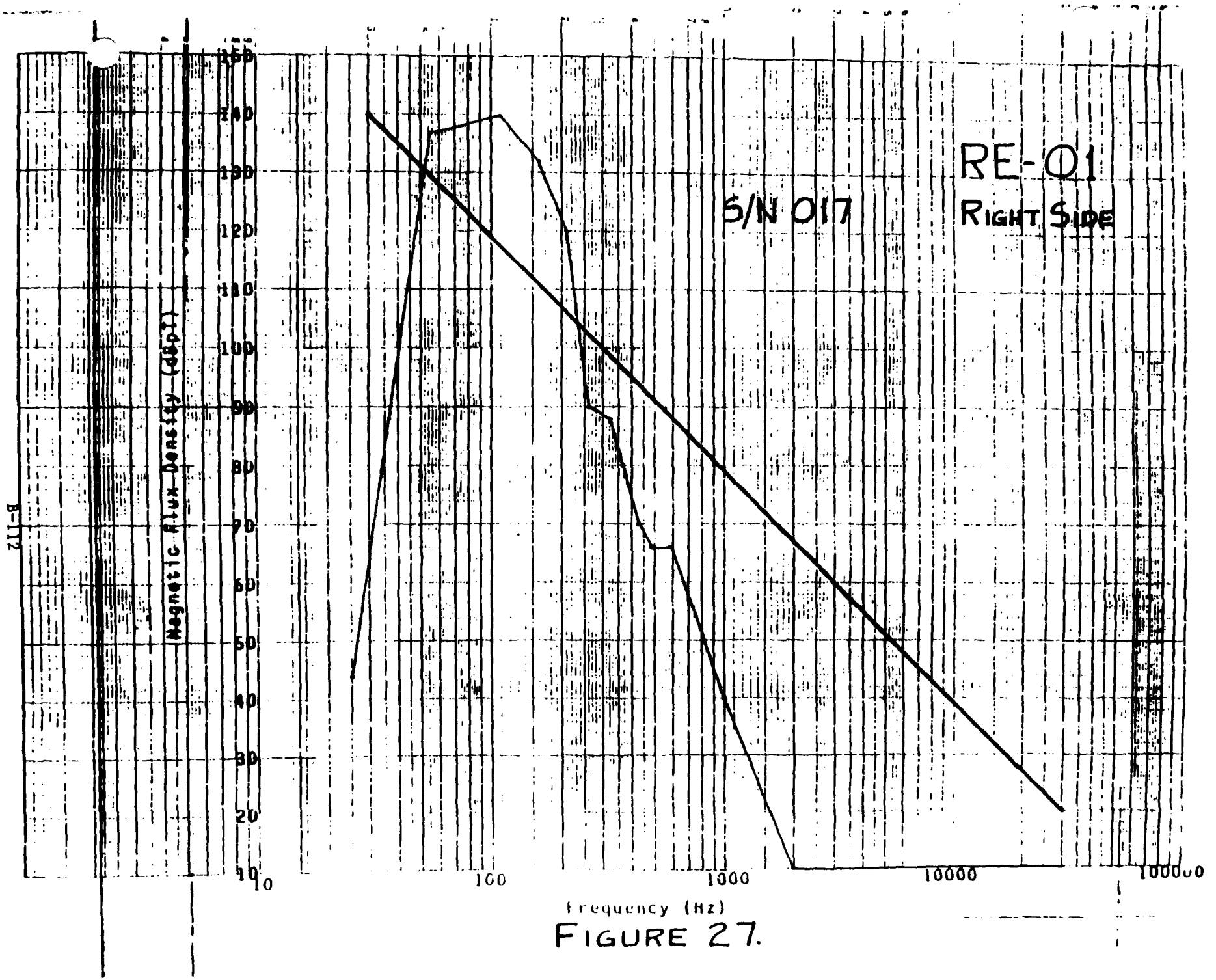

RE-01
S/N 017
RIGHT SIDE
Magnetic Flux Density (dBpi)
B-112
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
10
100
1000
10000
100000
Frequency (Hz)

FIGURE 27.

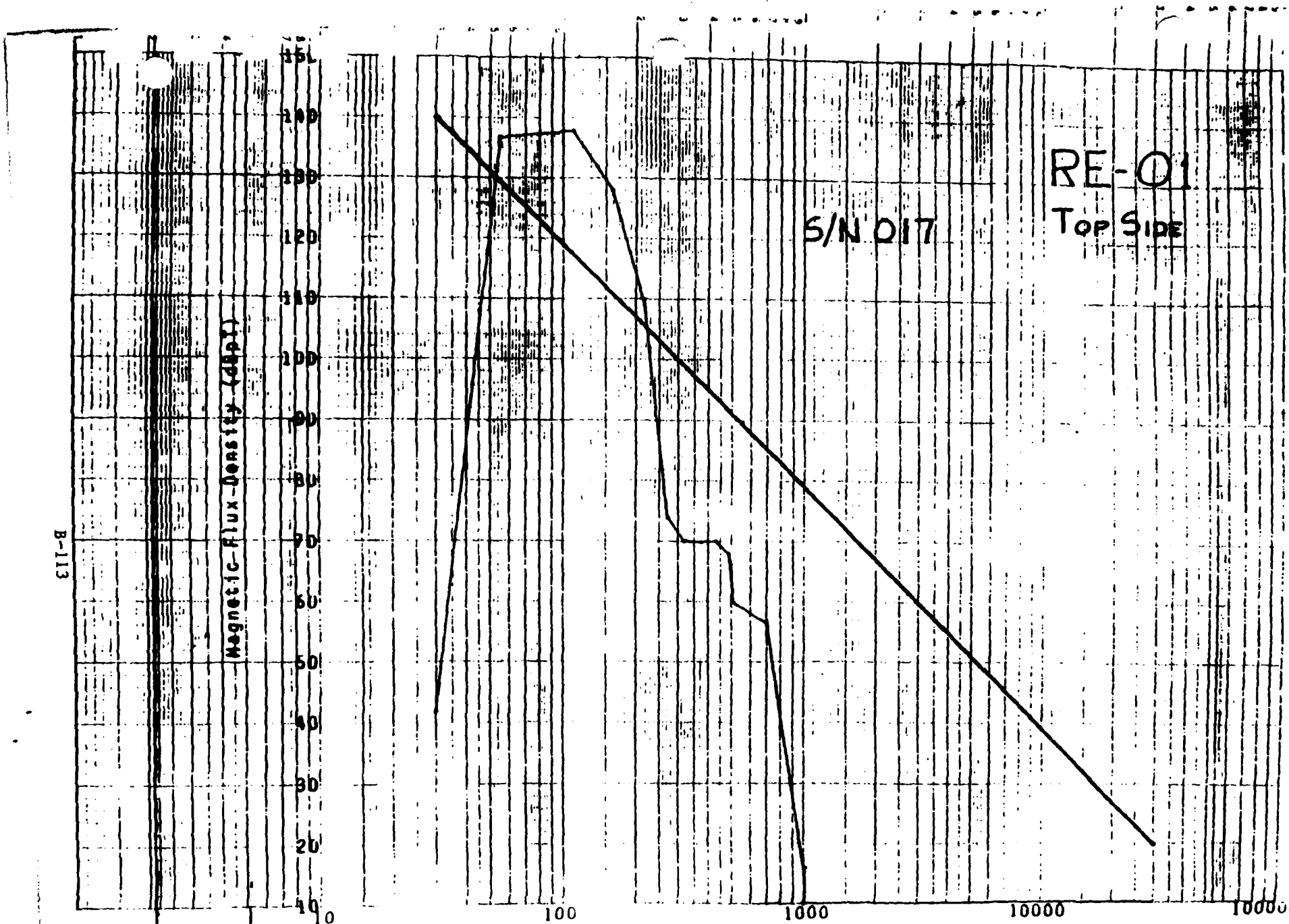

RE-01
S/N 017
TOP SIDE
Magnetic Flux Density (dB)
110
100
90
80
70
60
50
40
30
20
10
100
1000
10000
100000
Frequency (Hz)

FIGURE 28.

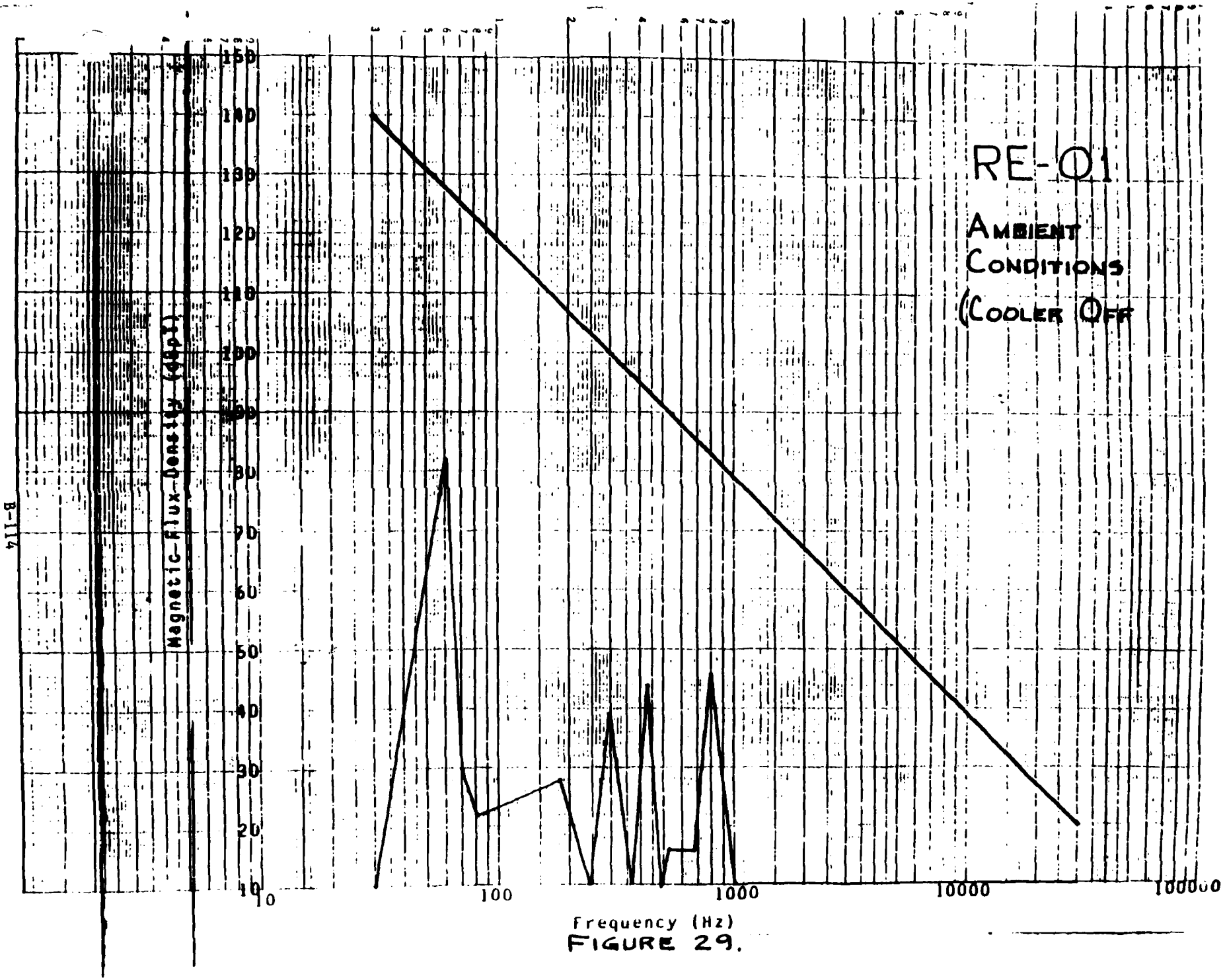

RE-01
AMBIENT
CONDITIONS
(COOLER OFF
Magnetic Flux Density (dBpT)
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
10
100
1000
10000
100000
Frequency (Hz)

FIGURE 29.

FIGURE 30.

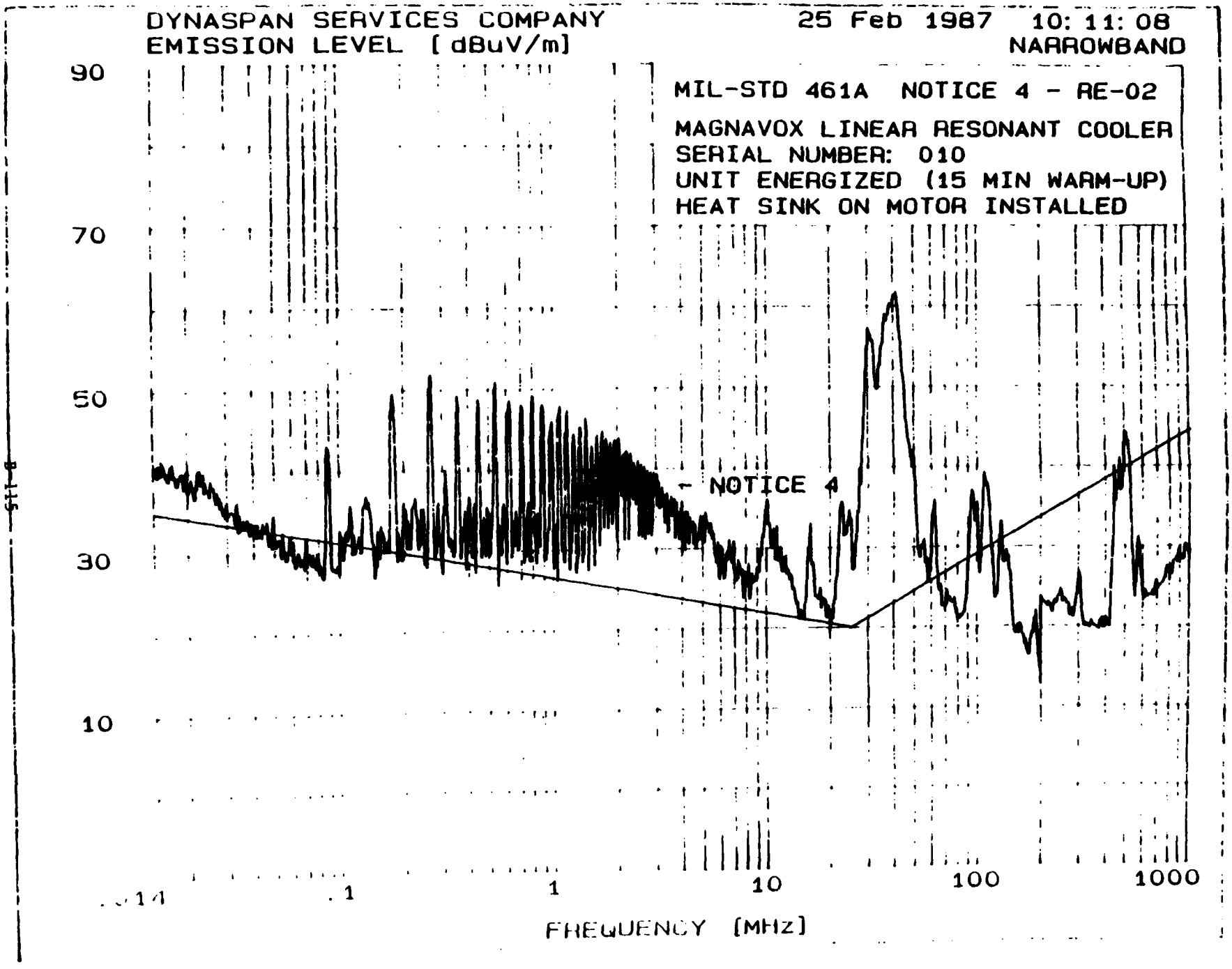

DYNASPAN SERVICES COMPANY
25 Feb 1987 10:11:08
EMISSION LEVEL [dBuV/m]
NARROWBAND
MIL-STD 461A NOTICE 4 - RE-02
MAGNAVOX LINEAR RESONANT COOLER
SERIAL NUMBER: 010
UNIT ENERGIZED (15 MIN WARM-UP)
HEAT SINK ON MOTOR INSTALLED
90
70
50
30
10
- NOTICE 4
.014
.1
1
10
100
1000
FREQUENCY [MHz]

FIGURE 31.

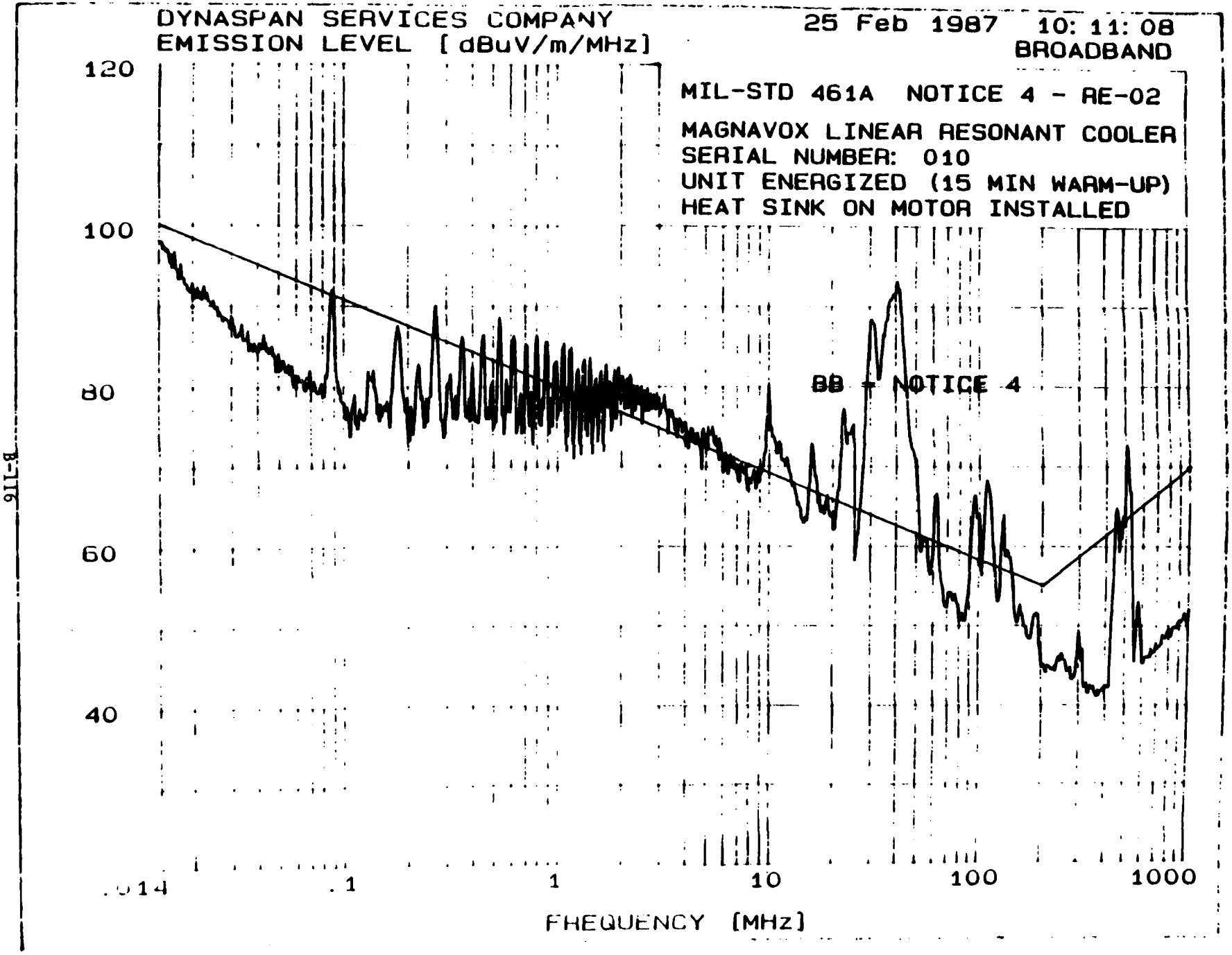

DYNASPAN SERVICES COMPANY
EMISSION LEVEL [dBuV/m/MHz]
25 Feb 1987 10:11:08
BROADBAND
MIL-STD 461A NOTICE 4 - RE-02
MAGNAVOX LINEAR RESONANT COOLER
SERIAL NUMBER: 010
UNIT ENERGIZED (15 MIN WARM-UP)
HEAT SINK ON MOTOR INSTALLED
BB - NOTICE 4
120
100
80
60
40
.014
.1
1
10
100
1000
FREQUENCY [MHz]
B-116

FIGURE 32.

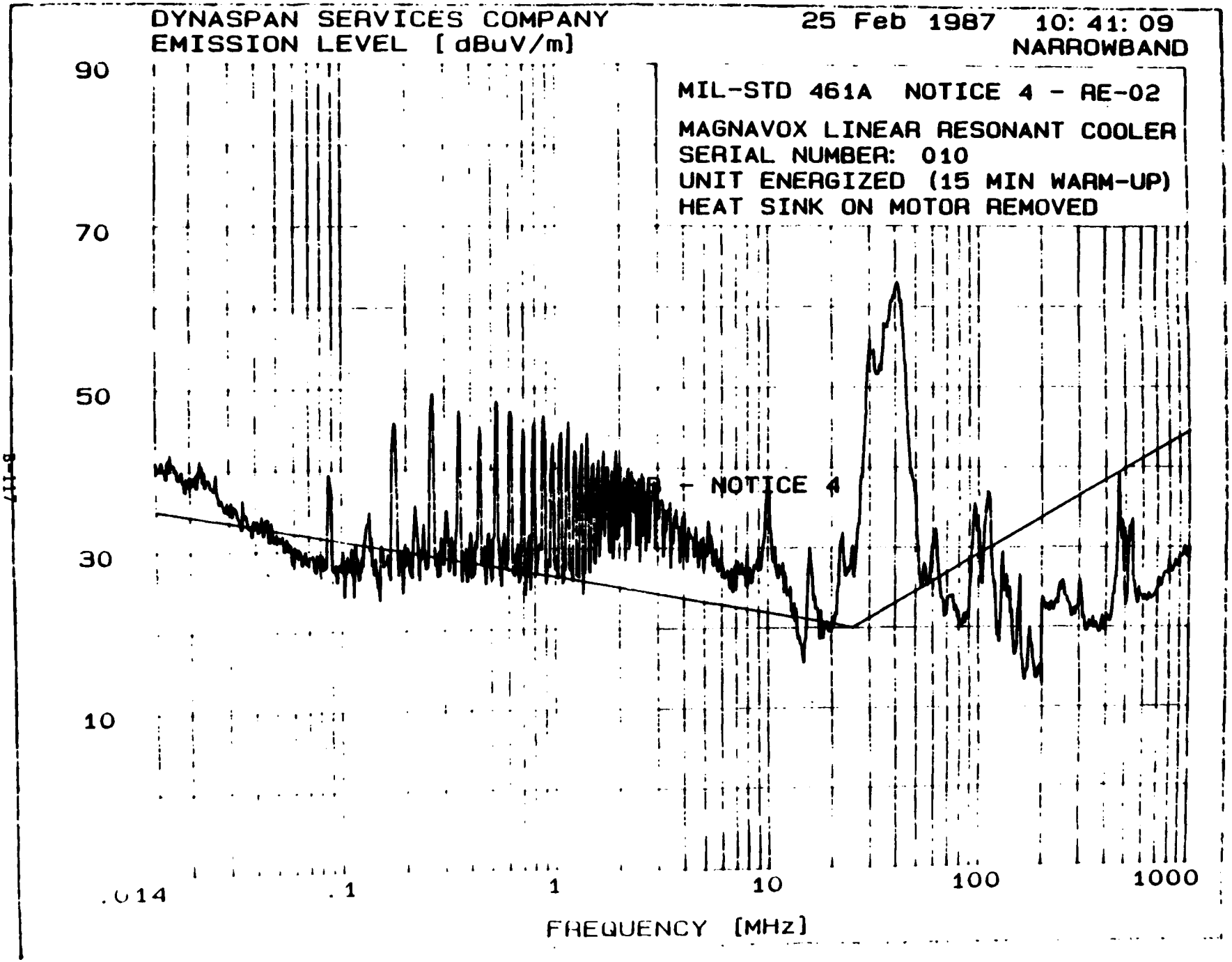

DYNASPAN SERVICES COMPANY
EMISSION LEVEL [dBuV/m]
25 Feb 1987 10:41:09
NARROWBAND
MIL-STD 461A NOTICE 4 - RE-02
MAGNAVOX LINEAR RESONANT COOLER
SERIAL NUMBER: 010
UNIT ENERGIZED (15 MIN WARM-UP)
HEAT SINK ON MOTOR REMOVED
90
70
50
30
10
- NOTICE 4
.014
.1
1
10
100
1000
FREQUENCY [MHz]

FIGURE 33.

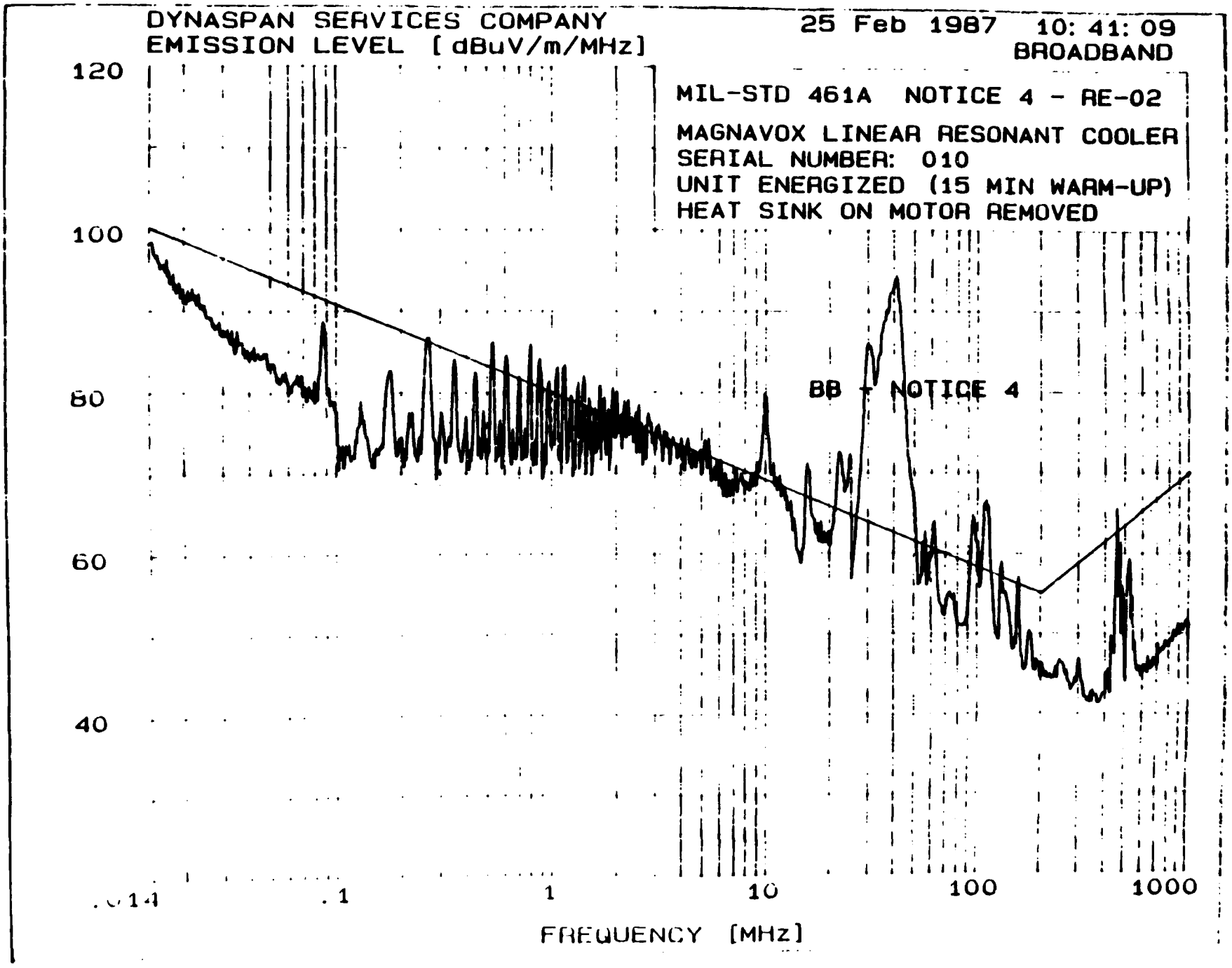

DYNASPAN SERVICES COMPANY
EMISSION LEVEL [dBuV/m/MHz]
25 Feb 1987 10:41:09
BROADBAND
MIL-STD 461A NOTICE 4 - RE-02
MAGNAVOX LINEAR RESONANT COOLER
SERIAL NUMBER: 010
UNIT ENERGIZED (15 MIN WARM-UP)
HEAT SINK ON MOTOR REMOVED
BB - NOTICE 4
120
100
80
60
40
.014
.1
1
10
100
1000
FREQUENCY [MHz]

FIGURE 34.

THIS SHEET INTENTIONALLY
LEFT BLANK

FIGURE 35.

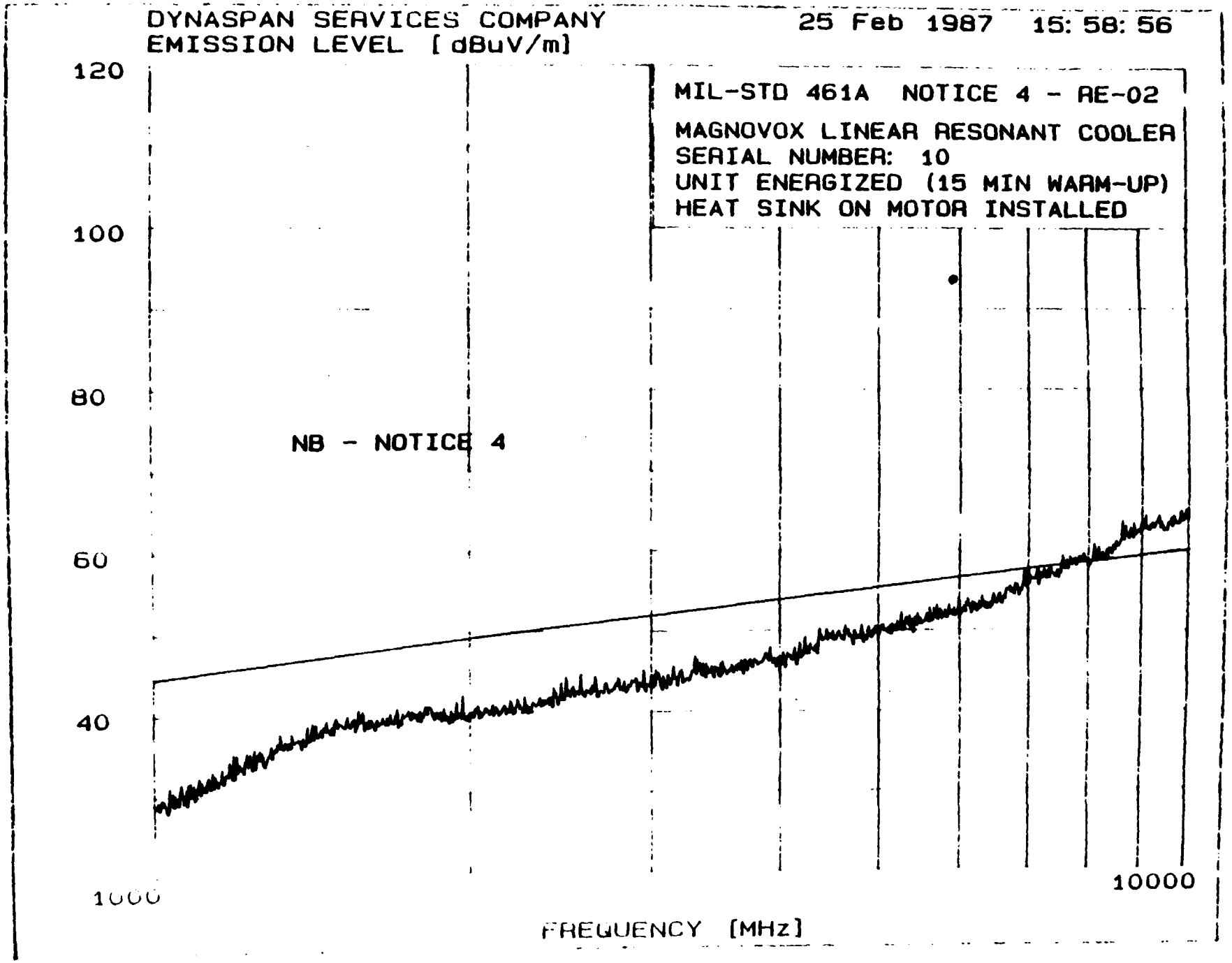

DYNASPAN SERVICES COMPANY
25 Feb 1987 15:58:56
EMISSION LEVEL [dBuV/m]
MIL-STD 461A NOTICE 4 - RE-02
MAGNOVOX LINEAR RESONANT COOLER
SERIAL NUMBER: 10
UNIT ENERGIZED (15 MIN WARM-UP)
HEAT SINK ON MOTOR INSTALLED
120
100
80
60
40
NB - NOTICE 4
1000
10000
FREQUENCY [MHz]

FIGURE 36

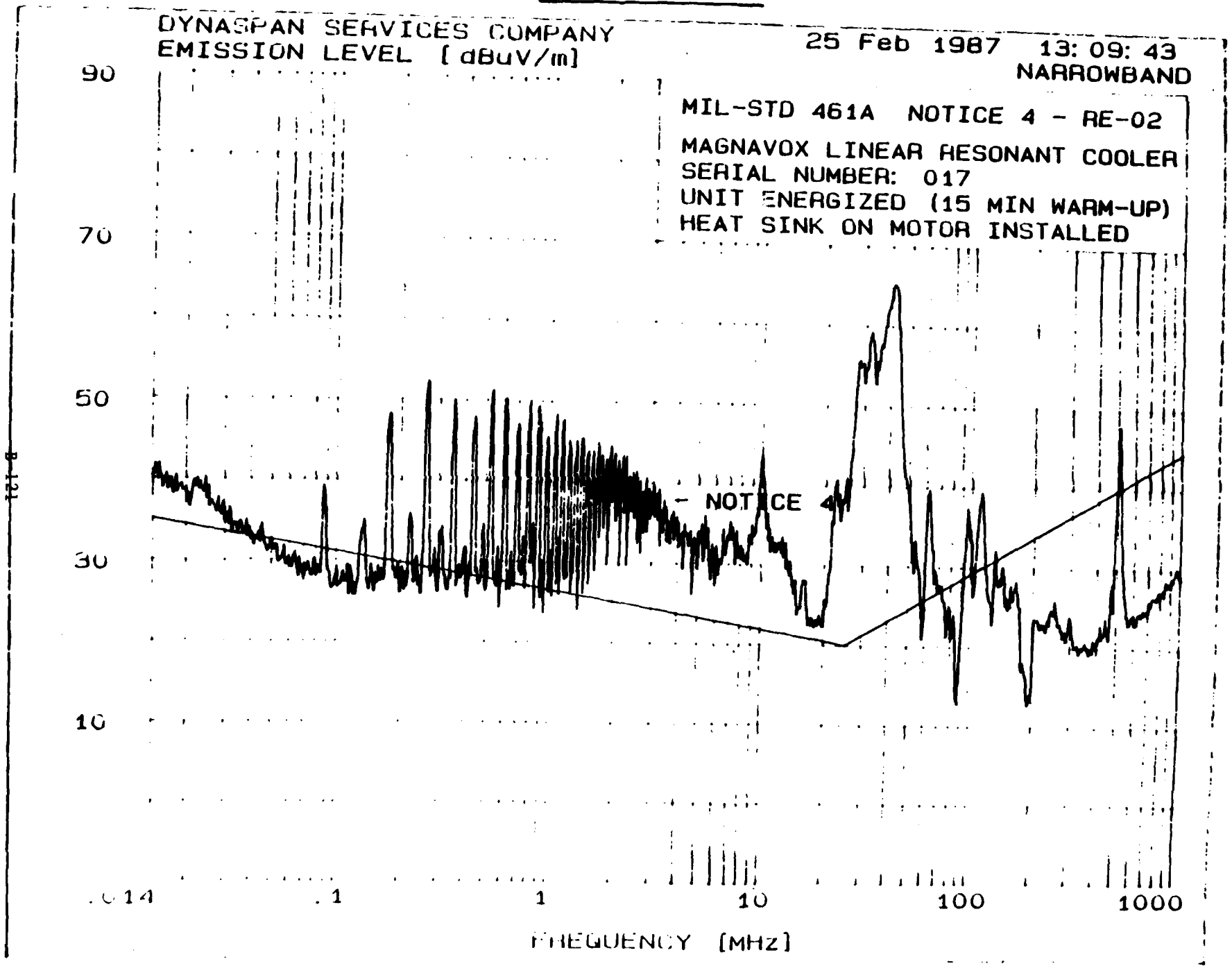
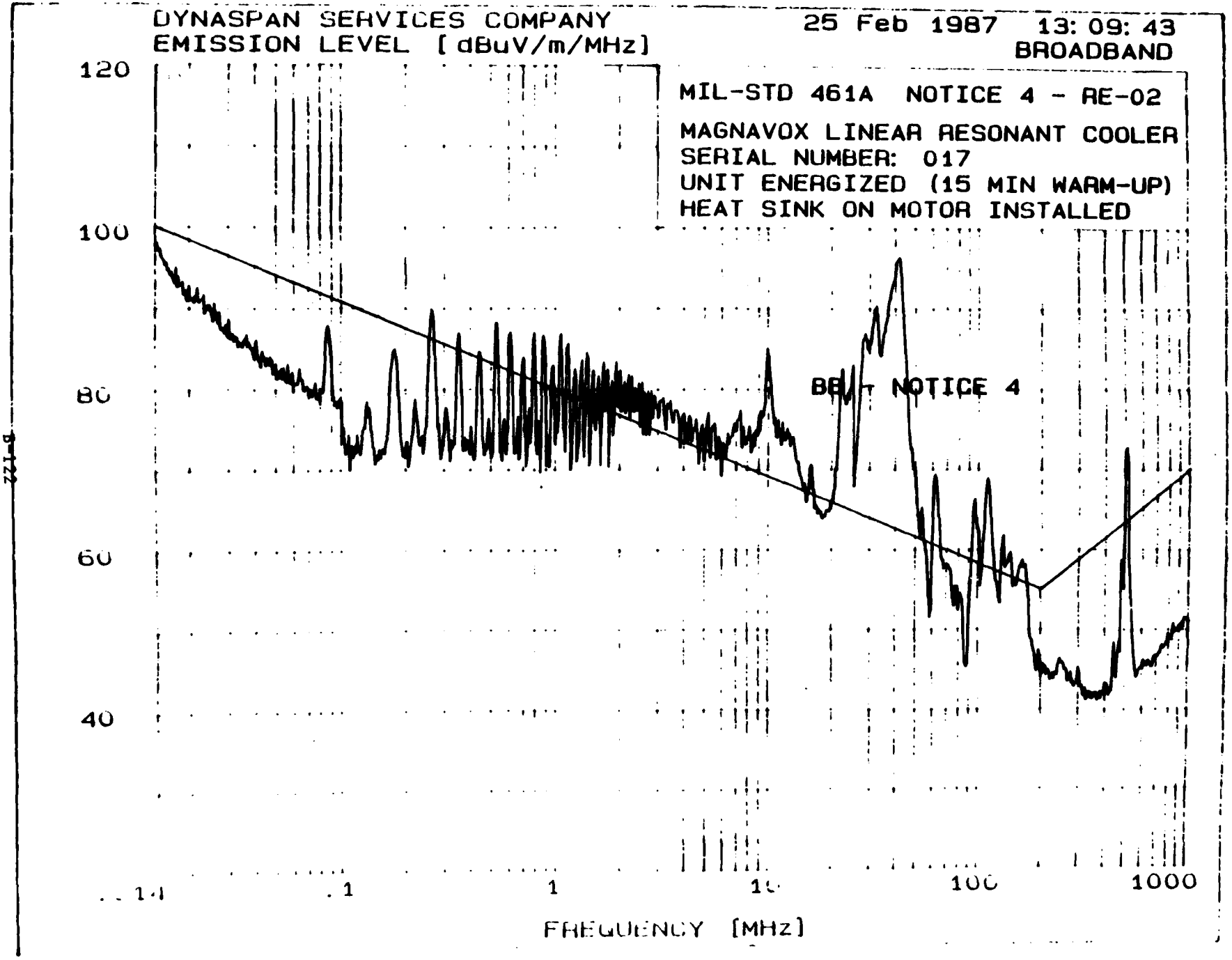

DYNASPAN SERVICES COMPANY
EMISSION LEVEL [dBuV/m]
25 Feb 1987 13:09:43
NARROWBAND
MIL-STD 461A NOTICE 4 - RE-02
MAGNAVOX LINEAR RESONANT COOLER
SERIAL NUMBER: 017
UNIT ENERGIZED (15 MIN WARM-UP)
HEAT SINK ON MOTOR INSTALLED
90
70
50
30
10
- NOTICE 4
.014
.1
1
10
100
1000
FREQUENCY [MHz]

FIGURE 37.


DYNASPAN SERVICES COMPANY
EMISSION LEVEL [dBuV/m/MHz]
25 Feb 1987 13:09:43
BROADBAND
MIL-STD 461A NOTICE 4 - RE-02
MAGNAVOX LINEAR RESONANT COOLER
SERIAL NUMBER: 017
UNIT ENERGIZED (15 MIN WARM-UP)
HEAT SINK ON MOTOR INSTALLED
BELT NOTICE 4
120
100
80
60
40
.1
1
100
1000
FREQUENCY [MHz]

F. URE 38.

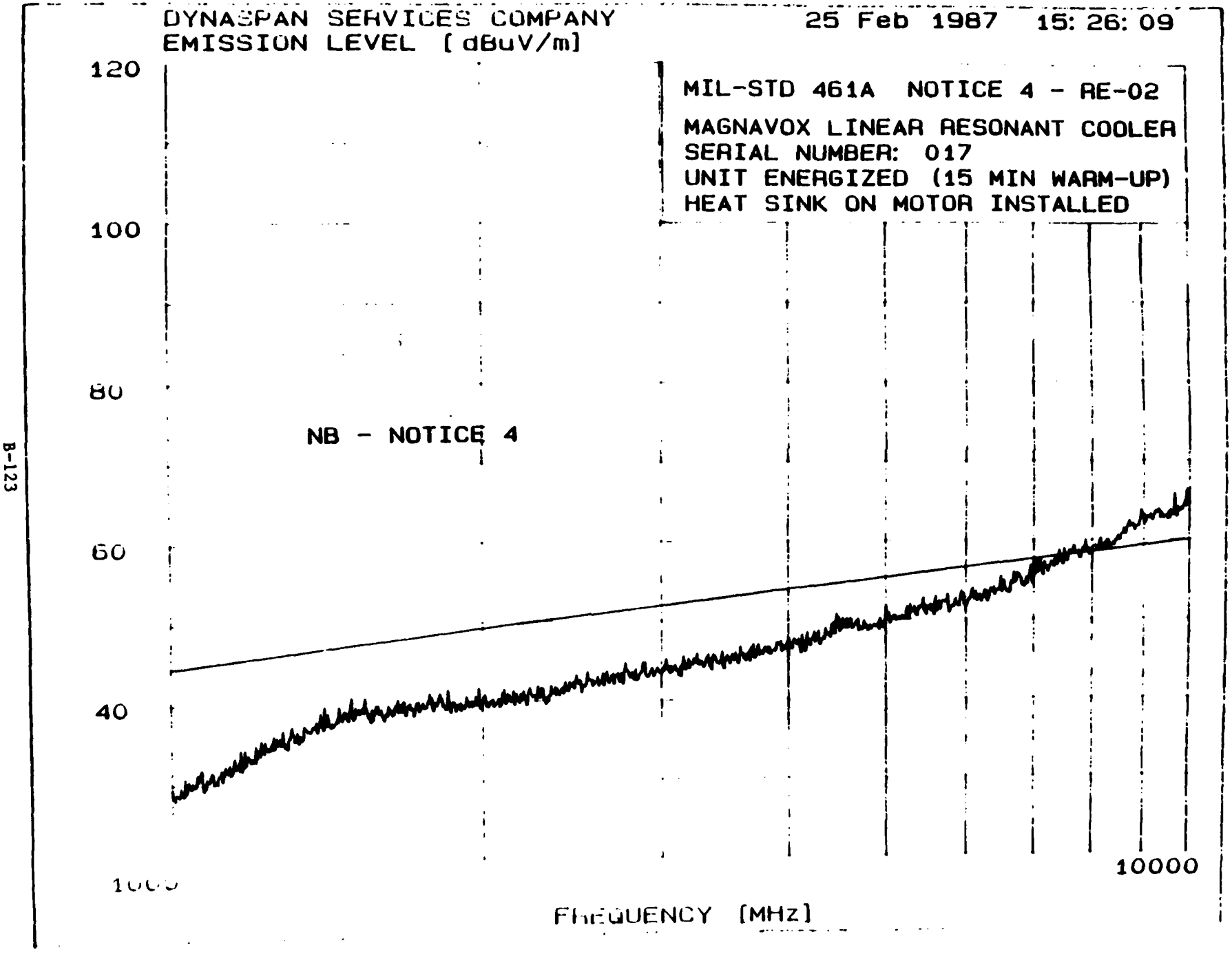

DYNASPAN SERVICES COMPANY
EMISSION LEVEL [dBuV/m]
25 Feb 1987 15:26:09
MIL-STD 461A NOTICE 4 - RE-02
MAGNAVOX LINEAR RESONANT COOLER
SERIAL NUMBER: 017
UNIT ENERGIZED (15 MIN WARM-UP)
HEAT SINK ON MOTOR INSTALLED
120
100
80
60
40
NB - NOTICE 4
10000
FREQUENCY [MHz]

FIGURE 39.

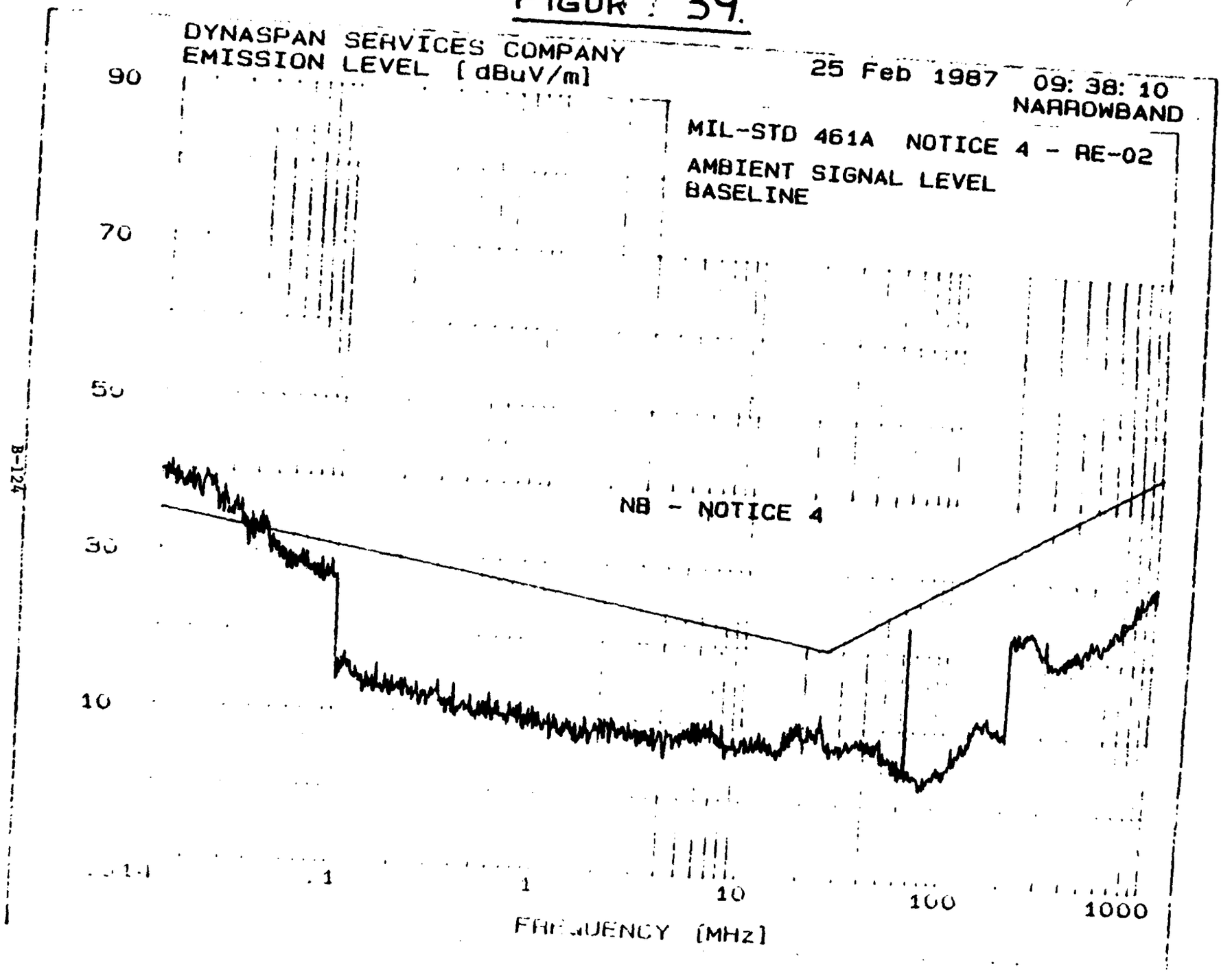

DYNASPAN SERVICES COMPANY
EMISSION LEVEL [dBuV/m]
25 Feb 1987 09:38:10
NARROWBAND
MIL-STD 461A NOTICE 4 - RE-02
AMBIENT SIGNAL LEVEL
BASELINE
NB - NOTICE 4
90
70
50
30
10
.1
1
10
100
1000
FREQUENCY [MHz]
B-124

FIGURE 40.

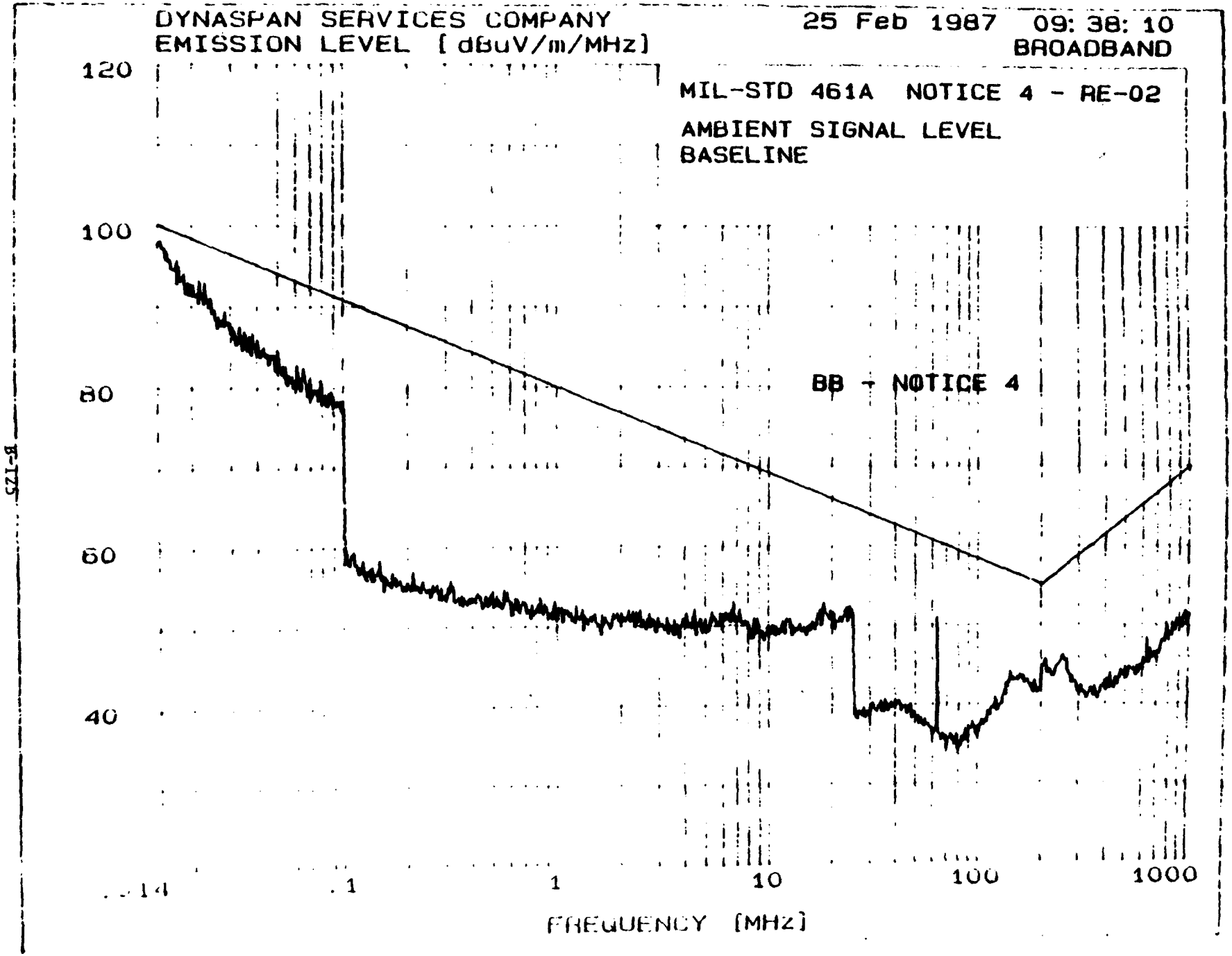
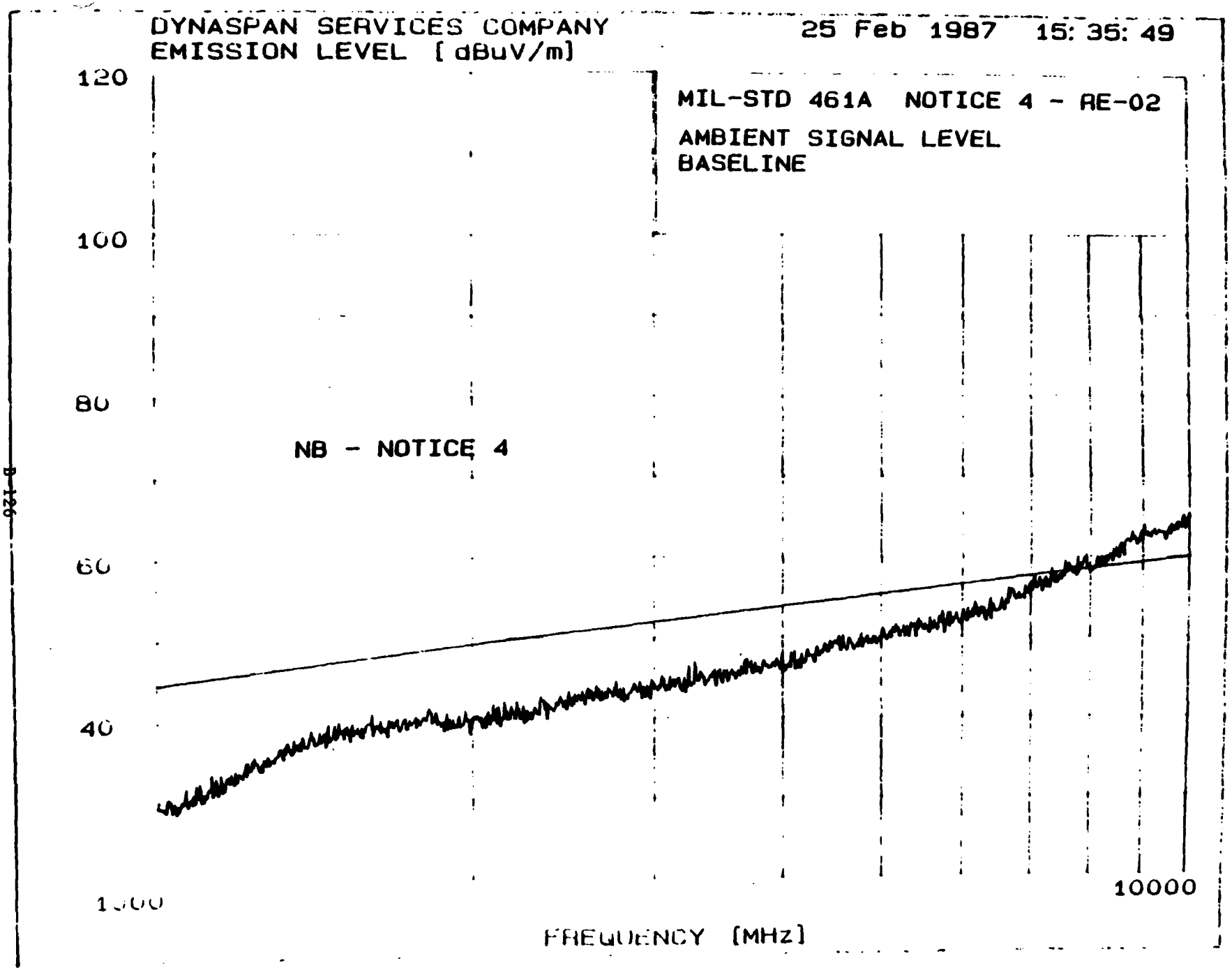

DYNASPAN SERVICES COMPANY
EMISSION LEVEL [dBuV/m/MHz]
25 Feb 1987 09:38:10
BROADBAND
MIL-STD 461A NOTICE 4 - RE-02
AMBIENT SIGNAL LEVEL
BASELINE
BB - NOTICE 4
120
100
80
60
40
.14
.1
1
10
100
1000
FREQUENCY [MHz]
SZI-1

FIGURE 41


DYNASPAN SERVICES COMPANY
EMISSION LEVEL [dBuV/m]
25 Feb 1987 15:35:49
MIL-STD 461A NOTICE 4 - RE-02
AMBIENT SIGNAL LEVEL
BASELINE
NB - NOTICE 4
120
100
80
60
40
10000
FREQUENCY [MHz]

RS-03
EMR TEST ENVIRONMENT

FREQUENCY (MHz)	CRITERIA FIELD (V/m)	POLARIZATION	MODULATION
0.14	10	V	A,B
0.750	10	V	A,B
2.175	50	V	A,B
3.7	50	V	A,B
5.3	50	V	A,B
7.75	50	V	A,B
10.46	50	V	A,B
13.964	50	V	A,B
20.12	50	V	A,B,C
24.5	50	V	A,B,C
26.0	50	V/H	A,B,C
30.0	50	V/H	A,B,C
36.0	50	V/H	A,B,C
44.0	50	V/H	A,B,C
52.0	50	V/H	A,B,C
63.6	50	V/H	A,B,C
75.7	10	V/H	A,B
141.5	10	V/H	A,B
355	10	V/H	A,B
403	10	V/H	A,D
490.8	10	V/H	A,D
798	10	V/H	A,D
942	10	V/H	A,D
1250	10	V/H	A,D
2450	10	V/H	A,D
6500	10	V/H	A,D
10000	10	V/H	A,D

= CONTINUOUS WAVE

= 50% MODULATED WAVE WITH 1000 Hz (± 5Hz) MODULATION FREQUENCY

= FM MODULATED WITH 8 kHz (± 1.5 kHz) DEVIATION AND 1000 Hz (± 5 Hz) MODULATION FREQUENCY

= PM WITH 10 us (± 1us) PULSE WIDTH ± 10% AND 800 Hz (± 5 Hz) PRF

FIGURE 42.

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC SERIAL NO. 011

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
9-26-87	22.2	—	.280	90.20	2.65	46.37	9640.0	6332.8	0840 RM
	-32.0	—	.280	94.10	2.75	48.12	9644.1	6336.9	1250
	-32.0	—	.208	74.90	2.78	48.65	9644.5	6337.4	1310
	52.0	—	.290	98.90	2.40	42.00	9647.4	6337.8	1600
	52.0	—	.232	92.20	2.40	42.00	9647.9	6338.3	1630
9-28-87	21.7	10.40	—	50.6	2.65	46.37	9698.2	6388.6	0700
	21.7	—	.350	97.90	2.60	45.50	9698.7	6389.1	0730
	21.4	—	.280	93.60	2.56	44.80	9699.4	6389.8	0810
	51.7	—	.290	105.10	2.45	42.87	9707.1	6397.5	1600
	52.6	—	.232	96.70	2.45	42.87	9708.6	6398.0	1630
1-29-87	21.6	12.1	—	50.70	2.60	45.50	9718.2	6409.6	0655
	21.6	—	.350	106.7	2.50	43.75	9718.8	6409.2	0730
	22.3	—	.280	96.6	2.56	44.80	9719.2	6409.6	0756
	-32.1	—	.280	105.8	2.90	50.75	9724.4	6414.8	1304
	-32.1	—	.208	94.3	2.95	51.62	9724.8	6415.2	1326
9-30-87	22.1	12.2	—	52.3	2.65	46.37	9738.3	6428.7	0700
	22.1	—	.350	113.2	2.56	44.80	9739.3	6429.2	0800
	22.0	—	.280	98.7	2.60	45.50	9740.0	6430.4	0842
	-32.0	—	.280	110.5	2.90	50.75	9744.2	6434.6	1300
	-32.0	—	.208	89.3	3.00	52.50	9744.8	6435.2	1333
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY _____

APPROVED BY _____ DATE 10-2-87

9-25 AMMETER NEEDLE IS ERRATIC AT ALL AMBIENT TEMPERATURES.

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC SERIAL NO. 011

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
9-21-87	-31.9	—	.280	85.40	2.50	43.75	9558.2	6220.8	1030 RM
	-31.8	—	.208	72.50	2.50	43.75	9558.7	6221.3	1100
	52.0	—	.290	98.90	2.30	40.25	9561.1	6223.7	1325
	52.0	—	.232	91.20	2.34	40.95	9561.8	6224.4	1405
9-22-87	-32.3	—	.280	85.50	2.50	43.75	9579.3	6241.9	0740
	-32.9	—	.208	72.70	2.56	44.80	9580.5	6243.1	0850
9-23-87	22.5	10.30	—	48.30	2.60	45.50	9598.8	6261.4	0700
	22.6	—	.348	100.10	2.56	44.80	9599.8	6262.4	0800
	22.6	—	.280	89.00	2.60	45.50	9600.2	6262.8	0830
	-32.1	—	.280	90.70	2.65	46.37	9604.7	6267.3	1300
	-32.1	—	.208	73.60	2.72	47.60	9605.2	6267.8	1330
	52.1	—	.290	98.90	2.40	42.00	9607.4	6300.0	1545
	53.2	—	.232	90.30	2.40	42.00	9607.7	6300.3	1600
9-24-87	22.4	10.30	—	48.40	2.70	47.25	9618.6	6311.2	0700
	22.5	—	.350	98.50	2.56	44.80	9619.4	6312.0	0745
	21.8	—	.280	88.50	2.60	45.50	9619.6	6312.2	0800
	-32.1	—	.280	91.90	2.70	47.25	9624.4	6317.2	1300
	-32.1	—	.208	73.90	2.72	47.60	9624.8	6317.6	1325
	52.2	—	.290	98.80	2.40	42.00	9627.7	6320.5	1604
	52.8	—	.232	91.90	2.40	42.00	9628.0	6320.8	1620
9-25-87	22.3	10.40	—	50.10	2.80		9638.3	6331.1	0700
	22.3	—	.351	97.80	2.60	45.50	9639.4	6332.2	0807
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY Robert Hunter

APPROVED BY

DATE 9/21 - 9/25/87

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC — SERIAL NO. 011

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
9-9-87	20.0	8.60	—	46.60	2.30	40.25	9470.0	6133.4	0700 RM
	20.4	—	.348	91.10	2.25	39.40	9470.8	6134.2	0750
	21.4	—	.280	80.20	2.30	40.25	9472.3	6135.7	0950
	-32.8	—	.280	82.00	2.45	42.90	9475.6	6139.0	1310
	-32.8	—	.208	68.30	2.50	43.75	9476.0	6139.4	1335
9-10-87	19.9	9.10	—	47.10	2.50	43.75	9490.4	6153.8	0840
	19.8	—	.348	94.10	2.25	39.40	9491.0	6154.4	0917
	19.1	—	.280	82.70	2.40	42.06	9491.7	6155.1	1000
	-32.1	—	.280	84.20	2.50	43.75	9491.7	6158.1	1301
	-32.1	—	.208	70.70	2.54	44.45	9495.2	6158.6	1330
	52.0	—	.296	93.40	2.32	40.60	9497.7	6159.1	1600
	52.0	—	.232	84.70	2.35	41.12	9498.1	6159.5	1615
9-11-87	21.9	9.00	—	47.60	2.50	43.75	9508.6	6170.5	0700
	21.7	—	.348	93.10	2.40	42.00	9509.3	6171.2	0730
	22.3	—	.290	85.00	2.30	40.25	9510.3	6172.2	0830
	-32.0	—	.280	84.20	2.50	43.75	9514.7	6176.6	1300
	-32.0	—	.208	70.10	2.54	44.45	9515.2	6177.1	1330
	52.0	—	.290	94.10	2.30	40.25	9517.6	6179.5	1600
	52.0	—	.232	84.60	2.32	40.60	9518.0	6179.9	1615 RM
9-21-87	21.8	10.30	—	48.60	2.60	45.50	9558.9	6217.8	0812 RM
	21.8	—	.347	97.20	2.32	40.60	9556.2	6219.8	0830 RM
	21.9	—	.279	85.50	2.45	42.90	9556.7	6219.3	0900 RM
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY Robert Hunter

APPROVED BY [signature]

DATE 9/9 — 9/21/87

TEST PERFORMED WITH FULL HEAT LOAD AND AT 20% REDUCTION AT ALL AMBIENT TEMPERATURES.

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC SERIAL NO. 011

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
8-27-87	21.5	8.6	—	46.8	2.10	36.75	9324.0	5991.2	
8-27-87	23.2	—	.355	89.3	2.20	38.50	9326.0	5993.2	
	-32.0	—	.356	91.6	2.35	41.20	9329.6	5996.3	
8-27 87	22.3	—	.295	92.6	2.25	39.40	9333.0	5999.6	
8-28-87	22.6	8.8	—	49.2	2.20	38.50	9344.6	6008.6	
	22.9	—	.295	84.0	2.20	38.50	9344.7	6009.3	
	22.8	—	.350	99.5	2.20	38.50	9345.3	6010.0	
	-32	—	**.355**	**92.0**	**2.32**	39.60	**9349.7**	6014.4	**1245**
8-31-87	20.4	8.50	—	51.7	2.35	41.20	9415.7	6080.4	
	20.9	—	.295	80.7	2.35	41.20	9416.2	6080.6	
	20.9	—	.351	89.7	2.35	41.20	9417.0	6081.4	
	-32.3	—	.351	91.1	2.35	41.20	9421.3	6085.7	
	51.3	—	.293	92.6	2.25	39.40	9424.6	6089.0	
9-1-87	20.4	8.60	—	51.7	2.35	41.20	9435.8	6100.2	
	20.9	—	.296	81.6	2.25	39.40	9436.3	6100.7	
	20.9	—	.354	89.8	2.35	41.20	9437.3	6101.7	
	-31.7	—	.355	93.6	2.35	41.20	9441.3	61057	12 32
	52.2	—	.296	93.2	2.25	39.40	9444.7	6108.1	
9-2-87	20.6	8.6	—	47.4	2.40	42.00	9459.7	6123.1	
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY _____

APPROVED BY _____ DATE 9-9-87

6/19/87

Foldback/Input Power
5 Day Data Collection
Unit S/N 011

Cooldown Time to 100 K 7.0 min.
" " " " 85 K 7.8 min.

20°C	VDC	I	WATTS	FBV	°K	H.L.
	17.5	2.10	36.75	0.0	79.8	.350
	17.5	1.98	34.65	1.50	80.5	.350
	17.5	1.74	30.45	1.20	80.2	.280
	17.5	2.04	35.70	0.0	72.0	.280
-32°C	17.5	1.96	34.30	0.0	78.7	.350
	17.5	1.93	33.78	0.94	80.1	.350
	17.5	1.67	29.23	3.30	80.4	.280
	17.5	1.98	34.65	0.0	68.9	.280
52°C	17.5	2.04	35.70	0.0	82.4	.290
	17.5	----	-----	---	----	.290
	17.5	1.87	32.73	3.07	80.5	.280
	17.5	2.07	36.23	0.0	75.4	.232

Foldback/Input Power
5 Day Data Collection
Unit S/N 011

6/17/87

Cooldown Time to 100 K 6.8 min.
" " " " 85 K 7.6 min.

	VDC	I	WATTS	EBV	K	H.L.
20 C						
	17.5	2.00	35.00	0.0	79.8	.350
	17.5	1.97	34.47	1.90	80.4	.350
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	17.5	2.03	35.52	0.0	71.3	.280
-32 C						
	17.5	1.95	34.12	0.0	79.7	.350
	17.5	1.92	33.60	1.35	80.5	.350
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	17.5	1.97	34.47	0.0	68.9	.280
52 C						
	17.5	2.05	35.88	0.0	82.0	.290
	17.5	----	-----	---	----	.290
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	17.5	2.07	36.23	0.0	75.3	.232

6/18/87

20 C						
	17.5	2.00	35.00	0.0	79.8	.350
	17.5	1.97	34.47	1.89	80.4	.350
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	17.5	2.03	35.52	0.0	71.2	.280
-32 C						
	17.5	1.95	34.12	0.0	80.3	.350
	17.5	----	-----	---	----	.350
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	17.5	1.97	34.47	0.0	69.0	.280
52 C						
	17.5	2.04	35.70	0.0	82.3	.290
	17.5	----	-----	---	----	.290
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	17.5	2.07	36.23	0.0	75.3	.232

+696 lbs

6/15/87

Foldback/Input Power
5 Day Data Collection
Unit S/N 011

Cooldown Time to 100 K 6.8 min.
" " " " 85 K 7.6 min.

20°C	VDC	I	WATTS	FBV	°K	H.L.
	17.5	1.98	34.65	0.0	79.5	.350
	17.5	1.96	34.30	1.96	80.4	.350
	17.5	1.72	30.10	3.19	80.0	.280
	17.5	2.02	35.35	0.0	71.5	.280
-32°C	17.5	1.96	34.30	0.0	80.5	.350
	17.5	----	-----	---	----	.350
	17.5	1.66	29.05	3.29	80.5	.280
	17.5	1.98	34.65	0.0	68.7	.280
52°C	17.5	2.05	35.88	0.0	82.5	.290
	17.5	----	-----	---	----	.290
	17.5	1.88	32.90	3.05	80.2	.232
	17.5	2.07	36.23	0.0	75.7	.232
						6/16/87
20°C	17.5	2.00	35,00	0.0	79.8	.350
	17.5	1.97	34.47	1.90	80.4	.350
	17.5	1.72	30.10	3.23	80.4	.280
	17.5	2.03	35.52	0.0	71.3	.280
-32°C	17.5	1.95	34.12	0.0	78.7	.350
	17.5	1.91	33.42	1.50	80.4	.350
	17.5	1.68	29.40	3.27	80.1	.280
	17.5	1.97	34.47	0.0	68.9	.280
52°C	17.5	2.04	35.70	0.0	83.0	.290
	17.5	----	-----	---,	----	.290
	[redacted]	1.87	32.72	3.04	80.3	.232
	17.5	2.07	36.23	0.0	75.9	.233

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC — SERIAL NO. 011

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
6-8-87	20.5	7.70	—	56.40	1.92	33.60	7747.6	4454.5	1138 RM
	20.1	—	.305	73.00	1.92	33.60	7748.0	4455.9	1200 RM
6-15-87	-32.6	—	.278	68.9	1.97	32.40 32.4	7889.1	4596.0	1123 RM
7-2-87	-19.6	—	.350	79.9	1.97	32.4	8205.3	4912.2	1312 RM
7-6-87	-23.3	—	.297	71.6	1.97	32.4	8285.6	4992.5	1326 RM
7-13-87	19.9 28.1 RM	—	.294	74.4	2.00	35.0	8420.8	5127.7	0840 RM
7-20-87	20.1	—	.293	74.9	2.10	36.75	8568.0	5274.9	1600 RM
8-3-87	22.3	8.4	—	56.70	2.10	36.75	8842.7	5509.6	1040 RM
8-11-87	-16.0	—	.300	74.30	2.25	39.40	9005.9	5672.8	1350 RM
8-12-87	36.8	—	.299	81.90	2.10	36.75	9028.4	5695.3	1615 RM
8-18-87	20.2	—	.301	78.40	2.00	35.00	9140.3	5807.2	0813 RM
8-18-87	-32.0	—	.299	77.10	2.40	42.00	9145.7	5812.6	1315 RM
8-19-87	40.1	—	.299	85.00	2.20	38.50	9168.5	5835.4	1623 RM
8-19-87	52	—	.299	90.4	2.20	38.5	9169.6	5836.5	1730 RM
8-20-87	22.2	—	.305	79.1	2.16	37.8	9180.9	5847.8	0845 RM
8-20-87	-32.0	—	.302	77.7	2.35	41.2	9185.7	5853.0	1300 RM
8-25-87	21.60	8.40	—	54.10	2.15	37.5	9279.9	5947.2	0700 RM
8-25-87	31.30	—	.299	80.00	2.20	38.50	9288.1	5955.4	1511 RM
8-26-87	23.1	—	.297	80.4	2.20	38.50	9305.4	5972.7	0832 RM
8-26-87	-32.0		.299	79.5	2.35	41.20	9309.6	5976.9	1245 RM
8-26-87	51.2		.296	92.5	2.25	39.40	9313.0	5980.9	1604 RM
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY _____

APPROVED BY _____ DATE 9-9-87

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 011

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
4-13-87	20.4	—	.345	74.9	1.86	32.55	6704.0	3412.9	1052 RM
	-32	—	.357	75.1	1.81	31.6	6706.5	3415.4	1323 RM
4-14-87	20.3	—	.351	74.9	1.86	32.55	6722.0	3430.9	0854 RM
	-32	—	.345	74.2	1.81	31.6	6726.3	3435.2	1313 RM
4-15-87	20.0	—	.345	74.7	1.86	32.55	6749.2	3458.1	1605 RM
	58.0		.285	76.4	1.90	33.25	6751.0	3459.9	18:00 RM
4-16-87	17.0	—	.344	74.4	1.85	32.3	6763.6	3472.5	1053 RM
	-32	—	.350	74.3	1.85	32.3	6766.7	3475.6	1338 RM
4-16-87	52	—	.280	76.7	1.91	34.4	6770.4	3479.3	1715 RM
4-17-87	20	—	.346	75.3	1.77	32.7 ~~30.9~~	6793.7	3492.6	1034 RM
4-20-87	-32	—	.296	67.6	1.78	32.9	6846.4	3553.3	1318 RM
4-22-87	20	—	.300	69.8	1.86	33.8	6881.1	3588.0	0800 RM
4-27-87	-32	—	.297	68.2	1.82	33.1	6986.3	3693.2	1311 RM
4-29-87	-32	—	.284	68.1	1.82	33.1	7026.6	3733.5	1329 RM
5-4-87	-4.5	—	.284	66.6	1.86	33.8	7124.7	3831.6	1137 RM
5-6-87	20.3	—	.286	69.4	1.87	34.2	7161.0	3867.9	0755 RM
5-11-87	20.3	—	.293	70.1	1.87	34.2	7261.0	3967.9	0755 RM
5-13-87	20.1	—	.293	70.4	1.87	34.2	7301.7	4008.6	0835 RM
5-15-87	20.1	—	.298	70.6	1.87	34.2	7341.1	4048.0	0804 RM
5-19-87	-9.3	—	.296	67.9	1.87	34.2	7385.6	4092.5	1320 RM
5-21-87	-32	—	.302	67.5	1.82	33.8	7427.4	4134.3	1508 RM
5-26-87	-33.1	—	.299	70.2	1.85	34.4	7526.6	4233.5	1424 RM
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

4414.2

PERFORMED BY _____

APPROVED BY _____ DATE 6-2-87

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC SERIAL NO. 01

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
3-14-87	-32	—	.354	73.	1.76	30.8	6207.3	2916.2	DM 0804
	20	6.5	—	46	1.86	32.6	6221.6	2930.5	0731 DM
	-32	—	.340	73.2	1.76	30.8	6227.6	2936.5	1313 RM
3-23-87	20	—	.348	69.7	1.83	32.0	6281.6	2990.5	0739 DM
	-32	—	.343	73.0	1.76	30.8	6287.3	2996.2	1313 RM
3-24-87	20	6.5	—	47.4	1.90	33.2	6301.6	3010.5	0727 DM
	20	—	.349	72.6	1.82	31.85	6304.9	3013.8	1020 RM
3-25-87	20	6.7	—	68.2	1.90	33.2	6321.6	3030.5	0717 RM
3-26-87	20	—	.343	74.3	1.82	31.85	6341.8	3050.7	0741 RM
3-27-87	20	—	.347	72.6	1.83	32.0	6361.6	3070.5	0931 DM
3-30-87	20	—	.345	73.5	1.83	32.0	6421.9	3130.8	0747 DM
3-31-87	20	—	.353	73.7	1.83	32.0	6444.3	3153.2	0812 DM
3-31-87	-12	—	.358	72.4	1.91	31.6	6448.1	3157	1402 DM
4-2-87	20	—	.346	73.9	1.83	32.0	6492.9	3191.8	0948 DM
4-3-87	20	—	.351	73.7	1.83	32.0	6501.9	3210.8	0749 DM
4-3-87	18	—	.353	73.8	1.83	32	6509.3	3219.2	
4-6-87	-28.3	—	.341	73.2	1.82	31.85	6566.3	3275.2	1315 RM
4-7-87	20	6.8	—	48.4	1.92	33.60	6581.6	3290.5	0832 RM
4-7-87	20.2	—	.347	74.3	1.84	32.20	6582.5	3291.4	0925 DM
4-8-87	20	—	.350	74.2	1.85	32.4	6602.0	3310.9	0856 RM
4-9-87	20	—	.353	74.4	1.85	32.4	6623.4	3332.3	1018 RM
4-9-87	-27	—	.353	73.3	1.82	31.8	6626.2	3335.1	1307 DM
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY _____

APPROVED BY _____ DATE 4-10-87

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC SERIAL NO. 011

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
3-10-87	52	—	.282	73.9	1.85	32.4	6035.9	2749.4	1710
3-11-87	20	6.4	——	46.2	1.85	32.4	6046.5	2760	0742 BM
	20	—	.339	71.7	1.79	31.3	6048.9	2762.4	1010
3-11-87	52	—	.280	73.6	1.84	32.2	6050.8	2764.3	1650
3-12-87	20	6.4	——	46.3	1.85	32.4	6062.0	2775.5	0755 DM
	20	—	.343	71.5	1.77	31.0	6064.0	2777.5	0955
	-32	—	.340	71.2	1.75	30.6	6067.4	2780.9	1320
3-12-87	52	—	.285	73.7	1.85	32.4	6070.8	2784.3	1640
3-13-87	20	6.4	——	46.4	1.85	32.4	6081.7	2795.2	0734
	20	—	.341	71.9	1.78	31.2	6084.5	2798.0	1025
	-32	—	.340	71.6	1.75	30.6	6086.9	2800.4	1245
3-13-87	52	—	.282	74.1	1.85	32.4	6090.9	2804.4	1645
3-16-87	20	6.5	——	46.4	1.86	32.6	6141.7	2855.2	0733 BM
	20	—	.343	71.8	1.79	31.3	6144.4	2857.9	1015
	-32	—	.341	71.8	1.76	30.8	6147.4	2860.9	1315
3-16-87	52	—	.287	74.3	1.86	32.6	6151.1	2864.6	1700
3-17-87	20	6.5	——	46.8	1.85	32.4	6161.6	2875.1	0732 BM
	20	—	.348	72.2	1.80	31.5	6164.4	2877.9	1020
	-32	—	.345	72.0	1.76	30.8	6167.4	2880.9	1320
3-17-87	52	—	.286	73.9	1.86	32.6	6170.6	2884.1	1630
3-18-87	20	6.5	——	46.8	1.86	32.6	6181.6	2895.1	0730 BM
3-19-87	20	—	.339	72.6	1.80	31.5	6202.1	2915.6	0758 RM
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY _____

APPROVED BY _____ DATE 3-20-87

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC — SERIAL NO. 011

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
3-3-87	20	6.3	—	47.0	1.84	32.2	5996.6	2600.1	B.M. 0744
	20	—	.343	71.5	1.76	30.8	5998.4	2601.9	0739 B.M.
	-32	—	.343	71.4	1.74	30.5	5892.3	2605.8	1330
	52	—	.281	73.0	1.81	31.7	5895.5	2609.0	1645
3-4-87	20	6.4	—	46.1	1.84	32.2	5906.6	2620.1	0747 BM
	20	—	.343	71.3	1.76	30.8	5908.9	2622.4	1010
	-32	—	.341	71.2	1.73	30.3	5912.2	2625.7	1330
3-4-87	52	—	.284	73.5	1.82	31.9	5915.9	2629.4	1710
3-5-87	20	6.4	—	46.2	1.85	32.3	5926.6	2640.1	0747 BM
	20	—	.348	70.9	1.77	31.0	5929.1	2642.6	1015
	-32	—	.343	71.3	1.74	30.5	5932.0	2645.5	1315
3-6-87	20	6.4	—	46.0	1.86	32.5	5946.6	2660.1	0747 BM
	20	—	.345	71.4	1.76	30.8	5949.4	2662.9	1035
	-32	—	.340	71.5	1.74	30.5	5952.0	2665.5	1315
3-6-87	52	—	.280	73.5	1.82	31.9	5955.7	2669.2	1700
3-9-87	20	6.4	—	46.4	1.85	32.3	6006.5	2720	0745 BM
	20	—	.342	71.4	1.77	31.0	6008.9	2722.4	1010
	-22 -32	—	.337	70.3	1.76	30.8	6012.2	2725.7	1330
3-9-87	52	—	.281	73.9	1.84	32.2	6015.6	2729.1	1650
3-10-87	20	6.4	—	56.1	1.85	32.3	6026.5	2740.0	0745 BM
	20	—	.340	71.7	1.78	31.2	6028.7	2742.2	0955
3-10-87	-22	—	.339	70.8	1.76	30.8	6032.0	2745.5	1315
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY _____

APPROVED BY _____ DATE 3-10-87

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 011

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
2-20-87	-32	—	.343	70.5	1.70	29.8	5672.3	2385.8	1330
2-20-87	52	—	.286	72.3	1.78	31.2	5675.7	2389.2	1700
2-23-87	20	—	.343	70.6	1.72	30.1	5727.8	2441.3	0900
	-32	—	.346	70.2	1.71	29.9	5732.3	2445.8	1330
2-23-87	52	—	.286	72.3	1.79	31.3	5735.5	2449.0	1645
2-24-87	20	6.3	—	45.0	1.80	31.5	5746.7	24692	0744
	20	—	.348	70.5	1.71	29.9	5749.2	2462.7	1025
	-32	—	.348	70.5	1.71	29.9	5752.0	2465.5	1315
2-24-87	52	—	.282	72.8	1.79	31.3	5755.8	2469.3	1700
2-25-87	20	6.3	—	45.4	1.82	31.85	5766.4	2479.9	0745
	20	—	.343	70.9	1.74	30.5	5768.7	2482.2	1055
	-32	—	.340	70.8	1.71	29.9	5772.0	2485.5	1315
2-25-87	52	—	.280	72.9	1.80	31.5	5775.5	2489.0	1645
2-26-87	20	6.3	—	45.5	1.82	31.8	5786.4	2499.9	0745
2-27-87	20	6.3	—	45.7	1.83	32.	5806.4	2519.9	0744
	20	—	.345	70.9	1.71	29.9	5809.1	2522.6	1030
	-32	—	.340	71.0	1.72	30.1	5812.0	2525.5	1315
	52	—	.280	73.3	1.81	31.7	5815.7	2529.2	1700
3-2-87	20	6.3	—	46.0	1.84	32.2	5866.4	2579.9	0736
	20	—	.344	70.9	1.73	30.3	5869.2	2582.7	1025
	-32	—	.343	71.1	1.72	30.1	5872.2	2585.7	1325
3-2-87	52	—	.284	73.3	1.82	31.9	5875.6	2589.1	1655
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY _____

APPROVED BY _____ DATE 3-2-87

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 011

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
2-12-87	-32	—	.352	69.7	1.67	29.2	5511.8	2225.3	1300
	52	—	.288	70.9	1.76	30.8	5515.7	2229.2	1650
2-13-87	20	6.2	—	44.7	1.76	30.8	5526.5	2240.0	0746
2-13-87	-32	—	69-347	69.7	1.67	29.2	5532.2	2245.7	1326
2-16-87	20	6.1	—	44.9	1.78	31.1	5586.5	2300.0	0744
"	20	—	.350	70.1	1.71	29.9	5589.2	2302.7	1025
"	-32	—	.349	69.8	1.69	29.6	5592.2	2305.7	1325
2-16-87	52	—	.286	72.0	1.77	31.0	5595.8	2309.3	1700
2-17-87	20	6.3	—	45.1	1.80	31.5	5606.5	2320.	0743
"	20	—	.347	70.4	1.71	29.9	5608.8	2322.3	1000
"	-32	—	.344	70.3	1.67	29.2	5612.3	2325.8	1330
2-17-87	52	—	.285	71.1	1.76	30.9	5615.5	2329.0	1645
2-18-87	20	6.3	—	45.1	1.80	31.5	5626.5	2340.0	0742
"	20	—	.350	70.1	1.73	30.2	5628.7	2342.2	0954
"	-32	—	.340	70.1	1.70	29.8	5632.2	2345.7	1325
2-18-87	52	—	.285	72.2	1.77	31.0	5635.6	2349.1	1650
2-19-87	20	6.3	—	45	1.8	31.5	5646.5	2360	0742
"	20	—	.345	70.3	1.72	30.1	5649.2	2362.7	1030
"	-32	—	.343	70.2	1.69	29.6	5652.2	2365.7	1330
2-19-87	52	—	.284	72.2	1.77	31.0	5655.5	2369.0	1645
2-20-87	20	6.3	—	45.5	1.80	31.5	5666.5	2380.0	0742
2-20 87	20	—	.350	70.4	1.72	30.1	5669.0	2382.5	1015
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY _____

APPROVED BY _____ DATE 2-20-87

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 011

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
2.5.87	-31	—	.353	69.0	1.55	27.1	5371.9	2085.4	1322 DM
	52	—	.290	71.8	1.75	30.6	5375.7	2089.2	1700
2.6.87	20	6.0	—	44.5	1.75	30.6	5386.4	2099.9	0740 DM
	20	—	.348	69.8	1.68	29.4	5389.4	2102.9	1040
	-32	—	.346	69.0	1.64	28.7	5392.3	2105.8	1330
	52	—	.286	71.6	1.75	30.6	53955	2109.0	1645
	20	—	.348	70.0	1.69	29.6	5398.8	2112.3	2000
2.9.87	20		—	44.7	1.76	30.8	5446.4	2159.9	0740 MT
	20	—	.347	69.9	1.70	29.75	5449.4	2162.9	1040 RM
	-32	—	.351	69.4	1.66	29.1	5452.1	2165.6	1320
	52	—	.292	71.6	1.76	30.8	5455.5	2169.0	1645
	20	—	.348	70.1	1.68	29.4	5458.8	2172.3	2000
2.10.87	20	—	———	44.5	1.76	30.8	5466.4	2179.9	0730 MT
	20	—	.350	69.6	1.70	29.75	5467.4	2192.9	1030 RM
	-32	—	.349	69.2	1.67	29.2	5471.8	2185.3	1300
	52	—	.286	72.0	1.76	30.8	5475.6	2189.1	1650
2.11.87	20	—	———	44.8	1.76	30.8	5486.4	2199.9	0736 MT
	20	—	.345	70.2	1.70	29.75	5489.1	2202.6	1019 RM
	-32	—	.346	69.6	1.67	29.2	5492.1	2205.6	1320 RM
	52	—	.289	71.9	1.76	30.8	5495.8	2209.3	1700
2.12.87	20	6.2	———	44.8	1.76	30.8	5506.5	2220.0	0745 MT
2-12-87	20	—	.346	69.9	1.70	29.8	5509.3	2222.8	1030
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY _____

APPROVED BY _____ DATE 2-12-87

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC SERIAL NO. 011

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
1-29-87	20	6.0	—	44.3	1.75	30.6	5226.5	1940.0	0742 DM
	20	—	.348	69.6	1.66	29.1	5228.8	1942.3	1000 DM
	20	—	.350	69.7	1.68	29.4	5229.2	1942.7	1023 AC
	-32	—	.349	69.0	1.63	28.5	5232.2	1945.7	1325 AC
	52	—	.290	71.5	1.74	30.5	5235.7	1949.2	1655
1-30-87	20	—	—	44.5	1.74	30.5	5246.5	1960.0	0940 DM
	-32	—	.355	68.9	1.63	28.5	5252.4	1965.9	1337 DM
	52	—	.290	71.6	1.74	30.5	5255.8	1969.3	1700
2-2-87	20	6.1	—	44.4	1.75	30.6	5306.4	2019.9	0740 DM
	20	—	.352	69.8	1.67	29.2	5309.2	2022.7	1025
	-32	—	.349	69.1	1.65	28.8	5311.9	2025.4	1305 DM
	52	—	.288	71.6	1.74	30.5	5315.8	2029.3	1700
2-3-87	20	6.1	—	44.5	1.75	30.6	5326.4	2039.9	0739 DM
	20	—	.348	69.7	1.68	29.4	5329.1	2042.6	1020
	-30	—	.348	68.9	1.65	28.8	5332.1	2045.6	1317 DM
	52	—	.287	71.5	1.75	30.6	5335.4	2048.9	1640
2-4-87	20	6.0	—	44.8	1.76	30.8	5346.4	2059.9	0740 DM
	20	—	.350	69.9	1.68	29.4	5349.0	2062.5	1020
	-32	—	.347	68.9	1.65	28.9	5352.2	2065.7	1326
	52	—	.288	71.5	1.75	30.6	5355.8	2069.3	1700
2-5-87	20	6.0	—	44.2	1.76	30.8	5366.4	2079.9	0740 DM
2-5-87	20	—	.352	69.6	1.70		5368.7	2082.2	0959 DM
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY _____

APPROVED BY _____ DATE 2-5-87

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC SERIAL NO. 011

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
1-21-87	20	6.0	—	43.7	1.75	30.6	5066.8	1775.8	0747 DM
	21	—	.350	70.2	1.69	29.5	5068.8	1777.8	0949 DM
	-20	—	.348	68.9	1.63	28.5	5073.0	1782.0	1400 DM
	52	—	.291	70.9	1.74	30.5	5075.7	1784.7	1655
	20	—	.350	69.1	1.55	27.1	—	—	2000
1-22-87	20	6.0	—	45.0	1.73	30.2	5086.5	1795.5	0745
	20	—	.348	69.0	1.71	29.9	5088.9	1797.9	1005
	-32	—	.346	68.2	1.64	28.7	5092.2	1801.2	1325
1-23-87	20	6.0	—	45.0	1.73	30.2	5106.7	1815.2	0745
	-32	—	.343	68.1	1.61	28.2	5112.3	1821.3	1329
1-26-87	20	—	.347	69.0	1.66	29.05	5167.1	1876.1	0820
	20	—	.347	69.1	1.66	29.1	5169.1	1878.1	1020
	-32	—	.345	68.3	1.62	28.4	5172.2	1881.2	1327
	52	—	.288	70.9	1.74	30.5	5175.8	1884.8	1700
1-27-87	20	—	—	44.4	1.74	30.5	5186.5	1895.5	0743
	20	—	.342	69.4	1.66	29.1	5189.2	1898.2	1023
	-32	—	.342	68.5	1.62	28.4	5192.2	1901.2	1327
	52	—	.286	70.9	1.74	30.5	5195.6	1904.6	1650
1-28-87	20	60	—	45.0	1.74	30.5	5206.5	1915.5	0740
	20	—	.343	69.0	1.67	29.2	5209.2	1918.2	1023
	-32	—	.344	68.3	1.62	28.4	5212.2	1921.2	1327
1-28-87	52	—	.284	70.8	1.74	30.5	5215.6	1929.1	1650
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY _____

APPROVED BY _____ DATE 1-28-87

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC SERIAL NO. 011

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
1-14-87	20	6.1	—	45.0	1.72	30.1	4927.3	1636.3	0815 D.M
	20	—	.354	70.2	1.65	28.8	4928.9	1537.9	0952 D.M
	-32	—	.347	69.4	1.60	28.0	4932.7	1641.7	1155 D.M
	20	—	.350	70.1	1.56	27.3	—	—	2000
1-15-87	20	6.0	—	44.7	1.72	30.1	4946.8	1655.8	0747 D.M
	20	—	.350	70.1	1.66	29.1	4949.1	1658.1	1005
	-32	—	.349	69.5	1.60	28.0	4952.5	1661.5	1330
	41	—	.390	66.4	1.69	29.5	4955.2	1664.2	1615 D.M
	20	—	.350	70.4	1.56	27.3	—	—	2000
1-16-87	20	6.0	—	45.0	1.74	30.45	4966.8	1675.8	0745 D.M
	20	—	.357	70.3	1.66	29.1	4968.5	1677.5	0930 D.M
	-30	—	.356	69.4	1.61	28.1	4972.6	1681.6	1335 D.M.
	52	—	.295	71.3	1.72	30.1	4976.1	1685.1	1700
	20	—	.350	70.1	1.56	27.3	—	—	2000
1-14-87	20	6.1	—	44.8	1.74	30.4	5026.8	1735.8	0745 D.M
	20	—	.356	70.1	1.66	29.1	5028.8	1737.8	0948 D.M
	-30	—	.350	68.6	1.61	28.1	5032.7	1741.7	1340 D.M
	52	—	.292	71.2	1.73	30.3	5035.9	1744.9	1655
1-20-87	20	6.0	—	44.2	1.73	30.3	5046.8	1755.8	0746 D.M
	20	—	.349	64.3	1.66	29.1	5048.4	1757.4	0947 D.M
	-32	—	.356	68.6	1.61	28.2	5052.5	1761.5	1330
1-20-87	52	—	.290	71.6	1.74	30.5	5055.9	1764.9	1655
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY _____

APPROVED BY _____ DATE 1-20-87

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC — SERIAL NO. 011

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
1-7-87	23	6.2	—	450	1.72	30.1	4789.1	1498.1	1257 D.M
	-31	—	.337	69.9	1.63	24.5	4792.4	1501.4	1412 D.M
1-8-87	20	6.0	—	47.6	1.72	30.1	4806.9	1515.9	0755 D.M
	41.1	—	.340	75.4	1.70	29.25	4806.9	1517.9	0955 D.M
	23	—	.340	70.9	1.65	24.1	4809.9	1518.9	1050
	-32	—	.340	70.4	1.60	28.0	4812.4	1521.4	1324 D.M
	52	—	.277	72.4	1.73	30.3	4816.6	1525.6	1730
	23	—	.340	71.3	1.62	26.6	—	—	
1-9-87	23	6.1	—	47.1	1.72	30.1	4827.1	1536.1	0804 D.M
	20	—	.335	71.2	1.65	24.1	4828.4	1537.4	0920 D.M
	-32	—	.337	70.3	1.60	28.0	4832.4	1541.4	1320
	52	—	.279	72.0	1.72	30.1	4836.5	1545.5	1730
	20	—	.337	70.5	1.5	26.2	—	—	2000
1-12-87	20	6.1	—	46.1	1.72	30.1	4886.9	1595.9	0755 D.M
	20	—	.343	70.3	1.65	28.9	4889.5	1598.5	1030
	-32	—	.337	69.9	1.59	27.8	4892.6	1601.6	1335
	52	—	.273	71.9	1.72	30.1	4896.5	1605.5	1730
	20	—		70.6	1.55	27.1	—	—	
1-13-87	20	6.0	—	40.9	1.74	30.5	4906.9	1615.9	0755 RC
	20	—	.337	70.3	1.65	28.9	4909.6	1618.6	1030 RC
	-32	—	.352	68.4	1.61	28.2	4913.0	1622.0	1400 RC
1-13-87	52	—	.288	71.9	1.73	30.3	4916.6	1625.6	1730
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY _____

APPROVED BY _____ DATE 1-13-87

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC SERIAL NO. 01

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
12-22-86	23	6.0	—	43.9	1.72	30.1	4467.3	1176.3	0740 D.M.
	23	—	.340	70.1	1.64	28.7	4469.2	1178.2	0946 D.M.
	-32	—	.340	70.4	1.58	27.6	4472.6	1191.6	0830 D.M.
	23	—	.340	70.9	1.55	27.1	—	—	2000
12-23-87	23	—	—	48.2	1.72	30.1	4487.3	1196.3	0740 D.M.
	23	—	.339	71.1	1.64	28.7	4489.0	1198.0	093 D.M.
	-32	—	.337	70.3	1.60	28.0	4492.8	1201.8	1330 D.M.
	52	—	.280	72.1	1.72	30.1	4497.0	1206.0	1730
12-24-86	23	6.1	—	42.4	1.73	30.3	4507.3	1216.3	0750
	23	—	.340	70.8	1.64	28.7	4509.0	1218.0	0930 D.M.
	-32	—	.336	70.3	1.58	27.7	4513.0	1222.0	1330
1-2-87	+40	—	—	50.1	1.72	30.1	4687.2	1396.2	0732 MT
	+49.9	—	.338	76.9	1.7	29.8	4688.9	1397.9	0925 MT
	-21.6	—	.338	68.4	1.6	28.0	4692.9	1401.9	1330 MT
1-5-87	20.4	6.4	—	43.5	1.74	30.45	4747.2	1456.2	0906 D.M.
	23	—	.338	71.0	1.69	29.6	4749.4	1458.4	1050
	-20	—	.336	68.6	1.62	28.3	4752.2	1461.2	1336 D.M.
	52	—	.276	72.2	1.71	29.9	4756.1	1465.1	1730
1-6-87	20	6.6	—	43.8	1.73	30.2	4766.8	1475.8	0800 D.M.
	37	—	.337	73.8	1.67	29.2	4767.9	1476.9	0930 D.M.
	-14	—	.333	68.2	1.63	28.5	4772.1	1491.1	1330 D.M.
1-7-87	20	6.4	—	44.8	1.72	30.1	4786.9	1495.9	0828 D.M.
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY _____

APPROVED BY _____ DATE 1-8-87

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 011

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
12-15-86	52	—	.270	71.1	1.71	29.9	4333	1046.1	1735
	23	—	.340	69.7	1.55	27.1			2000
12-16-86	23	6.6	—	45.3	1.72	30.1	4343.4	1056.4	0740 D.M.
	23	—	.330	69.6	1.63	28.5	4344.4	1057.4	0940 D.M.
	-32	—	.330	68.8	1.59	27.8	4345.9	1061.9	1330 D.M.
	52	—	.269	71.1	1.71	29.9	4353.0	1066.0	1730
	23	—	.330	69.6	1.55	27.1	—	—	2000
12-17-86	23	6.1	—	45.0	1.71	29.9	4363.4	1076.4	0740 D.M.
	23	—	.340	70.7	1.63	28.5	4364.4	1077.9	0930 D.M.
	-32	—	.341	70.0	1.59	27.8	4369.4	1082.4	1355
	52	—	.280	71.8	1.71	29.9	4373.1	1086.1	1730
	23	—	~~.346~~ .340	69.6	1.55	27.1	—	—	2000
12-18-86	23	—	—	41.2	1.72	30.1	4387.3	1100.3	0740 D.M.
	23	—	.342	71.1	1.64	28.7	4389.5	1102.5	0959 D.M.
	-32	—	.340	70.2	1.58	27.7	4392.8	1105.8	1320
	52	—	.280	72.2	1.71	29.9	4397.0	1110.0	1730
	23	—	.340	71.0	1.55	27.1	—	—	2000
12-19-86	23	6.1	—	45.2	1.72	30.1	4407.3	1120.3	0740 D.M.
	23	—	.340	70.5	1.64	28.7	4409.4	1122.4	0955 D.M.
	-32	—	.340	70.2	1.60	28.0	4413.0	1126.0	1330
	52	—	.281	71.8	1.71	29.9	4417.0		1730
12-20-86	23	—	.340	71.	1.55	27.1	—	—	2000
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY _____

APPROVED BY _____ DATE 12-22-86

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC — SERIAL NO. 011

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
12-9-86	23	6.1	——	45.1	1.67	29.2	4209.0	922	0740 D.M.
	23	—	.341	71.5	1.60	28.0	4210.5	923.5	0930 D.M.
	-32	—	.342	71.3	1.52	26.6	4214.6	927.6	1327 R.C.
	52	—	.280	72.1	1.68	29.4	4218.7	931.7	1730
	23	—	.340	71.1	1.54	26.95			2000
12-10-86	23	6.0	——	45.8	1.68	29.4	4225.9	941.9	0740 D.M.
	23	—	.347	72	1.60	28.0	4230.6	943.6	0930 D.M.
	-32	—	.340	72.7	1.70	29.8	4234.7	9427	1330 D.M.
	52	—	.279	73.5	1.70	29.8	4238.6	951.6	1730
	23	—	.340	72.3	1.54	26.9			2000
12-11-86	23	6.1	——	46.0	1.69	29.5	4248.9	961.9	0740 D.M.
	23	—	.345	71.5	1.62	28.3	4250.5	963.5	0930 D.M.
	-32	—	.339	71.5	1.54	26.9	4254.3	9673	1330 D.M.
	23	—	.340	72.3	1.54	26.9			2000
12-12-86	23	6.0	——	46.6	1.69	29.5	4268.9	981.9	0740 D.M.
	12	—	.344	70.6	1.59		4272.1	985.1	1100
	TEST STAND SHUT DOWN TO INSTALL RELAYS								
	TEST STAND TURNED ON AT 1630 HRS								
12-13-86	52	—	.276	70.8	1.69	29.5	4273.1	986.1	1730
12-15-86				48.7	1.69				
	23	—	.331	69.7	1.62	28.5	4325.4	1038.4	0955
12-15-86	-32	—	.332	69.1	1.57	27.5	4329.1	1042.1	1329
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY _____

APPROVED BY _____ DATE 12-15-86

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC — SERIAL NO. 011

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
12-2-86	-32	—	.344	70.9	1.54	27.0	4076.0	789.5	1330 D.M
	52	—	.279	71.9	1.69	29.6	4080.1	793.6	1730
	23		.340	70.7	1.54	26.6			2000
12-3-86	23	6.0	———	46.7	1.65	28.9	4090.3	803.8	0740 MT
	23	—	.340	71.0	1.60	28.0	4092.5	806.0	0955 MT
	-32	—	.337	70.2	1.53	26.8	4096.0	809.5	1330 MT
	52	—	.277	71.7	1.68	29.4	4100.0	813.5	1730
12-4-86	23	6.0	———	46.2	1.67	29.2	4110.3	8238	0735 MT
	23	—	.340	70.9	1.60	28.0	4112.5	826.0	0955 MT
	-32	—	.342	70.2	1.54	27.0	4116.0	829.5	1330 MT
	52	—	.278	71.6	1.69	29.6	4120.1	833.6	1730
	23	—	.340	70.4	1.52	26.6			2000
12-5-86	23	6.0	———	44.8	1.67	29.2	4130.3	843.8	0735 MT
	23	—	.341	70.9	1.60	27.2	4132.4	845.9	0950 MT
	-32	—	.336	70.3	1.56	27.3	4136.0	849.5	1330 MT
	52	—	.275	71.7	1.69	29.6	4140.0	853.5	1730
	23	—	.340	70.4	1.52	26.6			
12-7-86	23	6.1	—	44.4	1.66	29.05	4190.2	903.7	0740 D.M.
12-8-86	23	6.2	—	43.4	1.66	29.05	4191.7	904.7	1050 D.M.
	0	—	.337	70.1	1.56	27.3	4196.3	909.3	1516 D.M.
	52	—	.278	72.8	1.68	29.4	4198.7	911.7	1730
12-8-86	23	—	.340	71.5	1.52	26.6			2000
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY _____

APPROVED BY _____ DATE 12-9-86

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC SERIAL NO. 011

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
11-21-86	23	6.0	—	45.5	1.65	29.9	3850.4	563.9	0740 D.M
	23	—	.332	70.8	1.58	27.7	3852.1	565.6	0930 D.M
	-32	—	.330	70.0	1.52	26.6	3856.1	569.6	1330 D.M
	52	—	.283	71.2	1.67	29.2	3860.1	573.6	1730
11-24-86	23	6.0	—	43.6	1.67	29.2	3910.4	623.9	0740 D.M.
	23	—	336	70.8	1.60	28.0	3912.1	625.6	0930 D.M
	-32	—	343	70.8	1.55	27.1	3916.2	629.6	1330 D.M
11-25-86	23	6.0	—	43.6	1.72	30.1	3930.4	643.9	0740 D.M
	23	—	.336	70.8	1.61	28.1	3932.0	645.5	0930 D.M
	-32	—	.336	69.3	1.54	26.9	3936.6	650.1	1330 D.M.
	40	—	283	71.1	1.62	28.3	3938.7	652.2	1630 D.M.
11-26-86	23	6.0	—	46.6	1.68	29.4	3950.4	663.9	0740 D.M.
	23	—	.337	70.4	1.62	28.3	3952.1	665.6	0925 D.M
	-32	—	.337	69.6	1.54	26.9	3956.0	669.5	1330 D.M.
	52	—	.276	71.5	1.67	29.2	3959.8	673.3	1720
11-26-86	23	—	.100	50.5	1.56	27.3			2000
12-1-86	23	5.9	—	46.0	1.68	29.4	4050.3	763.8	0740 D.M.
	23	—	~~.273~~	70.3	1.61	28.1	4052.1	765.6	0930 D.M.
	-32	—	.340	70.1	1.54	26.95	4056.3	769.8	1330 D.M
	52	—	.280	71.9	1.69	29.6	4060.1	773.6	1730
	23	—	.340	70.6	1.54	26.95			2000 D.M
12-2-86	23	6.0	—	43.6	1.67	29.2	4070.3	783.8	0740 D.M
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY _____

APPROVED BY _____ DATE 12-3-86

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 011

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
11-14-86	23	5.9	—	43.6	1.54	27.0	3710.6	424.1	0745
	23	—	.344	68.6	1.57	27.5	3712.3	425.8	0930
	-32	—	.336	68.3	1.49	26.1	3716.1	429.6	1315
	52	—	.275	69.9	1.67	29.2	3720.5	434.0	1740
11-14-86	23	—	.350	68.6					
11-15-86	17	6.9	—	41.1	1.65	28.9	3733.6		1150
11-17-86	23	5.9	—		1.60	28.0	3770.8	484.3	0801 PH.
	23	—	.338	69.4	1.56	27.3	3772.5	486.0	0955
	-32	—	.340	68.3	1.51	26.4	3776.2	489.7	1335
11-17-86	52	—	.283	70.2	1.66	29.1	3780.1	493.6	1730
11-18-86	23	—	.348	68.9	1.57	27.5	3792.4	505.9	0950
	-32	—	.338	69.2	1.50	26.3	3796.1	509.6	1335
11-	52	—	.272	70.9	1.67	29.2	3800.1	513.6	1730
11-19-86	23	6.0	—	44.5	1.66	29.05	3810.3	523.8	0741 B.M.
	23	—	.347	70.2	1.57	27.5	3812.5	526.0	0955
	-32	—	.340	69.9	1.48	25.9	3816.0	529.5	1335 PH
	52	—	.279	71.3	1.68	29.4	3820.2	533.7	1735
11-20-86	23	6.0	—	45.4	1.65	28.8	3830.2	543.7	0740 B.M.
	23	—	.347	69.7	1.59	27.8	3832.0	545.5	0930 BM.
	-32	—	.336	69.8	1.49	26.1	3836.1	549.6	1330
	52	—	.276	71.5	1.66	29.1	3840.1	553.6	1735
11-20-86	23	—	.331	70.2	1.57	27.5	3843.2	556.7	2035
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY _____

APPROVED BY _____ DATE 11-20-86

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 011

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
11·7·86	23	—	.350	68.2	1.56	27.3	3572.3	285.8	0930
	-32	—	.340	67.3	1.48	25.9	3576.0	289.5	1315
11·7·86	23	—	.350	69.7	1.51	26.4		296.6	2000
11·10·86	23	5.9	—	45.6	1.64	28.7	3630.6	344.1	0746
	23	—	.352	68.6	1.57	27.5	3632.3	345.8	0930
	-32	—	.341	67.6	1.51	26.4	3636.3	349.8	1330
11·10·86	52	—	.281	69.7	1.68	29.4	3640.7	354.2	1750
11·11·86	23	5.9	—	44.4	1.64	28.7	3650.9	364.4	0805
	23	—	.336	68.9	1.57	27.5	3652.2	365.7	0920
	-32	—	.344	68.0	1.52	26.6	36563	369.8	1330
	52	—	.280	68.4	1.52	26.6		373.8	1730
11·11·86	23	—	.350	68.4	1.52	26.6		376.3	2000
11·12·86	23	5.9	—	44.4	1.64	28.7	3670.7	384.2	0851
	23	—	.338	68.5	1.57	27.5	3672.2	385.7	0925
	-32	—	.350	67.2	1.49	26.1	3676.1	389.6	1315
	52	—	.277	69.8	1.66	29.1	3680.5	394.0	1740
11·12·86	23	—	.350	68.5	1.52	26.6		396.3	2000
11·13·86	23	5.9	—	45.0	1.64	28.7	3690.6	404.1	0746
	23	—	.350	68.5	1.57	27.5	3692.3	405.8	0930
	-32	—	.339	68.4	1.50	26.3	3696.3	409.8	1330
	52	—	.280	69.8	1.67	29.2	3700.3	413.8	1730
11·13·86	23	—	.350	68.5	1.52	26.6		416.3	2000
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY Eugene V. LaBarge

APPROVED BY

DATE 11/13/86

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 011

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
10·31·86	23	5.6	—	43.3	1.61	28.2	3418.5	132.0	0741
	23	—	.347	67.8	1.54	27.0	3420.3	133.8	0930
	-32	—	.340	66.9	1.45	25.4	3424.1	137.6	1320
	52	—	.279	68.8	1.64	28.7	3428.5	142.0	1740
11·3·86	23	—	—	40.5	1.64	28.7	3490.5	204.0	0739
	23	—	.355	68.7	1.54	27.0	3492.3	205.8	0930
	-32	—	.339	67.7	1.47	25.7	3496.1	209.6	1315
11·3·86	52	—	.297	69.7	1.66	29.1	3500.3	213.8	1730
11·4·86	23	5.8	—	45.2	1.62	28.4	3510.6	224.1	0749
	23	—	.348	67.9	1.55	27.1	3512.4	225.9	0935
	-32	—	.343	67.1	1.47	25.7	3516.3	229.8	1330
11·4·86	52	—	.289	69.0	1.62	28.4	3520.4	233.9	1735
11·5·86	23	5.9	—	44.3	1.60	28.0	3530.7	244.2	0749
	23	—	.352	68.3	1.55	27.1	3532.3	245.8	0930
	-32	—	.356	67.3	1.47	25.7	3536.5	250.0	1335
	52		.279	69.5	1.65	28.9	3540.6	254.1	1740 A.M
11·5·86	23	—	.350	68.8	1.51	26.4		256.4	2000
11·6·86	23	5.9	—	45.8	1.63	28.5	3550.6	264.1	0748
	23	—	.350	68.1	1.55	27.1	3552.7	266.2	0955
	-32	—	.343	67.1	1.50	26.3	3556.2	269.7	1320
11·6·86	52	—	.281	69.4	1.66	29.1	3560.5	274.0	1740
11·7·86	23	5.9	—	44.3	1.64	28.7	3570.6	284.1	0748
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY Diane V. Lukaryi

APPROVED BY

DATE 11/7/86

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC — SERIAL NO. 011

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
10·24·86	33	5.5	—	43.4	1.63	28.5	3286.5	RESTART OF LIFE TEST	1640
	52	—	.284	67.9	1.62	28.4	3288.1	1.6	1820
10·24·86	23	—	.350	68.9	1.45	25.4		3.3	2000
10·27·86	23	—	.350	66.9	1.53	26.8	3338.8	52.3	0800
	23	—	.350	66.8	1.53	26.8	3340.4	53.9	0930
	-32	—	.341	65.6	1.45	25.4	3344.3	57.8	1330
	52	—	.279	68.2	1.62	28.4	3348.4	61.9	1735
10·27·86	23	—	.350	67.8	1.50	26.3		64.3	2000
10·28·86	23	5.7	—	42.4	1.60	28.0	3358.4	71.9	0733
	23	—	.348	67.0	1.53	26.8	3360.4	73.9	0930
	-32	—	.346	65.6	1.43	25.0	3364.2	77.7	1315
	52	—	.288	67.9	1.62	28.3	3368.5	82.0	1740
10·29·86	23	5.6	—	42.4	1.61	28.2	3378.5	92.0	0742
	23	—	.346	66.9	1.53	26.8	3380.3	93.8	0930
	-32	—	.350	65.8	1.45	25.4	3384.4	97.9	1335
	52	—	.290	67.9	1.62	28.4	3388.4	101.9	1735
10·29·86	23	—	.350	67.1	1.50	26.3		104.3	2000
10·30·86	23	5.6	—	42.4	1.62	28.4	3398.5	112.0	0742
	23	—	.350	67.1	1.53	26.8	3400.6	114.1	0945
	-32	—	.348	66.1	1.46	25.6	3404.3	117.8	1330
	52	—	.276	68.7	1.63	28.5	34083	121.8	1730
10·30·86	23	—	.350	70.1	1.55	27.1		124.3	2000
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY Diane V. Lukasyi

APPROVED BY _____ DATE 10/30/86

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 015

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
12-4-86	-32	—	.345	74.3	1.44	25.2	6462.9	1598.4	1330
	-32	—	.283	69.5	1.62	28.4	6466.9	1602.4	1730
	23		.340	69.0	1.52	26.6			2000
12-5-86	23	6.2	—	39.9	1.65	28.9	6477.2	1612.7	0735 MT
	23	—	.344	69.2	1.55	26.4	6479.3	1614.8	0950 MT
	-32	—	.342	73.5	1.43	25.0	6482.9	1618.4	1330 MT
		—	.282	69.9	1.61	28.2	6486.9	1622.4	1730
12-8-86	Cooler	Was Removed Due To Excessive shrilling noise					6537.1		10.50 D.M.
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY _____

APPROVED BY _____ DATE 12-8-86

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC — SERIAL NO. 015

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
11-25-86	-32	—	.343	71.3	1.39	24.3	6283.5	1419.0	1330 D.M.
	40	—	.386	66.9	1.5	26.2	6285.7	1426.2	1830 D.M.
11-26-86	23	6.2	—	41.2	1.55	27.1	6297.3	1432.9	0740 D.M.
	23	—	.344	69.2	1.46	25.5	6299.0	1434.5	0925 D.M.
	-32	—	.342	72.2	1.4	24.5	6302.9	1438.4	1330 D.M.
	52	—	.282	69.6	1.54	27.0	6306.8	1442.3	1720
	23	—	.100	49.0	1.52	26.6			2000
12-1-86	23	6.1	—	41.1	1.64	28.7	6397.2	1532.7	0740 D.M.
	23	—	.340	68.3	1.54	27.0	6399.0	1539.5	0930 D.M.
	-32	—	.346	73.9	1.42	24.9	6403.2	1538.7	1330 D.M.
	52	—	.286	69.7	1.59	27.8	6407.1	1542.6	1735
	23	—	.340	69.1	1.52	26.6			2000 D.M.
12-2-86	23	6.1	—	41.5	1.64	28.7	6417.2	1552.7	0744 D.M.
	-32	—	.340	74.7	1.44	25.2	6422.9	1558.4	1330 D.M.
	52	—	.286	69.7	1.61	28.2	6427.0	1562.5	1730
	23		.340	69.2	1.52	27.0			2000
12-3-86	23	6.2	—	41.4	1.61	28.2	6437.2	1572.7	0740 MT
	23	—	.340	69.0	1.52	26.6	6439.4	1574.9	0955 MT
	-32	—	.343	73.0	1.47	25.7	6442.9	1578.4	1330 MT
12-3-86	52	—	.283	69.4	1.60	28.0	6446.9	1582.4	1730
12-4-86	23	6.2	—	40.0	1.66	29.1	6457.2	1592.7	0735 MT
12-4-86	23	—	.344	69.1	1.57	27.5	6459.4	1594.9	0755 MT
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY _____

APPROVED BY _____ DATE 12-8-86

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC — SERIAL NO. 015

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
11-17-86	52	—	.289	68.8	1.51	26.4	6127.0	1262.5	1730
11-18-86	23	—	.351	67.9	1.43	25.0	6139.3	1274.8	0950
	-32	—	.346	69.4	1.40	24.5	6143.1	1278.6	1335
	52	—	.283	69.4	1.54	27.0	6147.0	1282.5	1730
11-19-86	23	6.1	—	41.4	1.52	26.6	6157.2	1292.7	0744 A.M
	23	—	.350	68.9	1.42	24.9	6159.4	1294.9	0955
	-32	—	.346	71.8	1.37	23.9	6162.9	1298.4	1335 A.M
	52	—	.286	69.9	1.53	26.8	6167.1	1302.6	1735
11-20-86	23	6.2	—	41.9	1.52	26.6	6177.1	1312.6	0740 A.M
	23	—	.350	68.4	1.43	25.0	6179.0	1314.5	0930 A.M
	-32	—	.345	71.6	1.39	24.3	6183.0	1318.5	1330
	52	—	.285	69.7	1.54	27.0	6187.0	1322.5	1730
	23	—	.343	68.9	1.42	24.9	6190.1	1325.6	2030
11-21-86	23	6.2	—	41.4	1.55	27.1	6147.3	1332.8	0740 A.M
	23	—	.343	69.3	1.44	25.2	6199.0	1334.5	0930 A.M
	-32	—	.342	71.8	1.37	23.9	6203.0	1336.5	1330 A.M
	52	—	.289	69.4	1.52	26.6	6207.0	1342.5	1730
11-24-86	23	6.2	—	40.7	1.56	27.3	6257.3	1392.8	0740 A.M
	23	—	.346	69.6	1.44	25.2	6259.0	1394.5	0930 A.M
	-32	—	.349	72.2	1.4	24.5	6263.0	1398.6	1330 A.M
11-25-86	23	6.3	—	40.9	1.61	28.1	6277.3	1412.8	0740 A.M
11-25-86	23	—	.343	69.4	1.46	25.5	6277.9	1414.4	0930 A.M
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY _____

APPROVED BY _____ DATE 11-25-86

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 015

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
11·11·86	-32	—	.348	67.5	1.42	24.9	6003.2	1138.7	1330
	52	—	.280	66.4	1.42	24.9		1142.7	1730
11·11·86	23	—	.350	66.8	1.40	24.5		1145.2	2000
11·12·86	23	6.0	—	39.5	1.53	26.8	6017.6	1153.1	0851
	23	—	.345	65.5	1.42	24.9	6019.2	1154.7	0925
	-32	—	.353	66.9	1.43	25.0	6023.0	1158.5	1315
	52	—	.285	67.1	1.52	26.6	6027.4	1162.9	1740
11·12·86	23	—	.350	66.4	1.41	24.7		1165.2	
11·13·86	23	6.0	—	39.7	1.52	26.6	6037.5	1173.0	0746
	23	—	.352	65.5	1.43	25.0	6039.2	1174.7	0930
	-32	—	.346	69.0	1.38	24.2	6043.2	1178.7	1330
	52	—	.285	67.6	1.51	26.4	6047.2	1182.7	1730
11·13·86	23	—	.350	66.3	1.40	24.5		1185.2	2000
11·14·86	23	6.1	—	40.4	1.50	26.3	6057.5	1199.0	0745
	23	—	.349	66.8	1.42	24.9	6059.2	1194.7	0930
	-32	—	.344	69.2	1.43	25.0	6063.0	1198.5	1315
	52	—	.275	67.6	1.52	26.6	6067.4	1202.9	1740
11-14-86	23	—	.350	66.9					
11·15·86	17	7.2	—	38.5	1.50	26.3	6080.5		1100
11-17-86	23	6.1	—		1.45	25.37	6117.7	1253.2	0801 PH
	23	—	.346	68.3	1.41	24.7	6119.4	1254.9	0955
11·17·86	-32	—	.347	69.6	1.39	24.3	6123.1	1258.6	1335
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY _____

APPROVED BY _____ DATE 11-1?-86

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC — SERIAL NO. 015

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
11.4.86	23	—	.350	65.6	1.39	24.3	5859.3	994.8	0935
	-32	—	.347	66.2	1.34	23.5	5863.3	998.8	1330
11.4.86	52	—	.290	66.0	1.50	26.3	5867.3	1002.8	1735
11.5.86	23	6.0	—	44.8	1.48	25.9	5877.6	1013.1	0749
	23	—	.353	65.9	1.39	24.3	5879.3	1014.8	0930
	-32	—	.354	66.8	1.41	24.7	5883.4	1018.9	1335
	52		.286	67.0	1.50	26.3	5887.5	1023.0	1745
11.5.86	23	—	.350	66.6	1.45	25.4		1025.3	2000
11.6.86	23	6.0	—	39.8	1.49	26.1	5897.5	1033.0	0748
	23	—	.352	65.6	1.42	24.9	5899.7	1035.2	0955
	-32	—	.347	66.8	1.43	25.0	5903.2	1038.7	1325
11.6.86	52	—	.286	66.4	1.51	26.4	5907.5	1043.0	1740
11.7.86	23	6.0	—	39.7	1.53	26.8	5917.5	1053.0	0748
	23	—	.351	65.4	1.42	24.9	5919.2	1054.7	0930
	-32	—	.346	67.2	1.43	25.0	5923.0	1058.5	1315
11.7.86	23	—	.350	67.5	1.45	25.4		1065.3	2000
11.10.86	23	6.0	—	39.9	1.53	26.8	5977.5	1113.0	0746
	23	—	.353	66.5	1.42	24.8	5979.2	1114.7	0930
	-32	—	.347	67.5	1.43	25.0	5983.2	1118.7	1330
11.10.86	52	—	.286	66.3	1.54	27.0	5987.6	1123.1	1750
11.11.86	23	6.0	—	39.9	1.53	26.8	5997.8	1133.3	0805
11.11.86	23	—	.345	66.5	1.43	25.0	5999.1	1134.6	0920
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY Diane V. LaBerge

APPROVED BY _____ DATE 11/11/86

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 015

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
10·28·86	23	—	.347	64.3	1.46	25.6	5707.3	842.8	0930
	-32	—	.347	64.3	1.37	24.0	5711.1	846.6	1315
	52	—	.289	65.8	1.51	26.4	5715.4	850.9	1740
10·29·86	23	5.8	—	39.7	1.52	26.6	5725.5	861.0	0742
	23	—	.347	65.3	1.44	25.2	5727.3	862.8	0930
	-32	—	.349	65.0	1.38	24.2	5731.4	866.9	1335
	52	—	.289	65.1	1.51	26.4	5735.4	870.9	1735
10·29·86	23	—	.350	65.1	1.45	25.4		873.3	2000
10·30·86	23	5.7	—	39.2	1.52	26.6	5745.5	881.0	0742
	23	—	.350	65.1	1.43	25.0	5747.5	883.0	0945
	-32	—	.348	65.2	1.41	24.7	5751.2	886.7	1330
	52	—	.282	66.3	1.51	26.4	5755.3	890.8	1730
10·30·86	23	—	.350	67.6	1.45	25.4		893.3	2000
10·31·86	23	5.8	—	43.7	1.52	26.6	5765.4	900.9	0741
	23	—	.350	65.8	1.44	25.2	5767.3	902.8	0930
	-32	—	.347	66.4	1.38	24.2	5771.1	906.6	1320
	52	—	.286	66.3	1.51	26.4	5775.4	910.9	1740
11·3·86	23	—	—	37.5	1.54	27.0	5837.4	972.9	0739
	23	—	.355	66.5	1.46	25.6	5839.2	974.7	0930
	-32	—	.346	66.3	1.39	24.3	5843.0	978.5	1315
11·3·86	52	—	.295	66.1	1.51	26.4	5847.3	982.8	1730
11·4·86	23	6.0	—	40.1	1.45	25.4	5857.6	993.1	0749
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY Diane L. Lukenyo

APPROVED BY

DATE 11·4·86

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC SERIAL NO. [illegible]

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
[illegible]	-32	—	[illegible]	65.3	1.34	23.5	[illegible]	[illegible]	[illegible]
	52	—	[illegible]	65.3	1.50	[illegible]	5574.3	[illegible]	[illegible]
10·22·86	23	5.9	—	39.3	1.54	27.0	5584.4	719.9	[illegible]
	23	—	.350	[illegible]	1.44	25.2	5586.2	721.7	[illegible]
	-32	—	.347	64.7	1.36	23.8	5590.2	725.7	[illegible]
	52	—	.284	66.2	1.50	26.3	5594.2	729.7	1725
10·22·86	23	—	.350	65.2	1.45	25.4		732.3	2000
10·23·86	23	5.7	—	39.4	1.54	27.0	5604.4	739.9	0735
	23	—	.352	64.5	1.44	25.2	5606.3	741.8	0935
	-32	—	.351	64.7	1.35	23.6	5610.3	745.8	1335
	52	—	.289	66.1	1.51	26.4	5614.3	749.8	1735
10·24·86	23	5.9	—	39.4	1.54	27.0	5624.4	759.9	0737
	23	—	.349	64.3	1.46	25.6	5626.3	761.8	0930
	-32	—	.351	64.8	1.36	23.8	5630.4	765.9	1335
	52	—	.286	65.9	1.51	26.4	5635.1	770.6	1820
10·24·86	23	—	.350	66.9	1.45	25.4		772.3	2000
10·27·86	23	—	.350	64.3	1.46	25.6	5685.8	821.3	0600
	23	—	.350	64.6	1.46	25.6	5687.3	822.8	0930
	-32	—	.345	64.6	1.41	24.7	5691.3	826.8	1330
	52	—	.283	66.5	1.50	26.3	5695.4	830.9	1735
10·27·86	23	—	.350	65.9	1.45	25.4		833.3	2000
10·28·86	23	5.9	—	39.3	1.52	26.6	5705.4	840.9	0733
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY [signature]

APPROVED BY [signature] DATE 10/28/86

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 015

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
10·15·86	-32	—	.350	64.8	1.37	24.0	5466.5	602.0	1315
10·15·86	52	—	.287	65.6	1.50	26.3	5470.9	606.4	1740
10·15·86	23	—	.350	65.5	1.45	25.4		[illegible]	2000
10·16·86	23	5.8	—	39.4	1.52	26.6	5480.9	616.4	0740
	23	—	.347	64.2	1.43	25.0	54824	617.9	0910
	-32	—	.351	64.6	1.35	23.6	5486.6	622.1	1320
	52	—	.290	653	1.50	26.3	5490.9	626.4	1740
10·16·86	23		.350	65.0	1.45	25.4		[illegible]	2000
10·17·86	23	5.8	—	39.0	1.52	26.6	5500.9	636.4	0740
	23	—	.351	64.1	1.44	25.2	55029	638.4	0935
	-32	—	.344	65.1	1.35	23.6	5506.5	642.0	1315
	52		.283	65.5	1.50	26.3	5510.7	646.2	1738
10 20 86	23	5.8	—	34.0	1.52	26.6	55445	680.0	0740
* 10·20·86	Power failure occurred between Fri, 10-17 (1135) and Monday, 10-20 (0700). System [illegible] at 0740.								
10·20·86	23	—	.349	64.3	1.45	25.4	5546.2	681.7	0925
	-32	—	.348	65.3	1.35	23.6	5550.2	685.7	1325
	52	—	.284	66.3	1.50	26.3	5554.3	689.8	1730
10·20·86	23	—	.350	65.1	1.4	24.5		[illegible]	
10·21·86	23	5.8	—	34.1	1.52	26.6	5564.7	[illegible]	0740
10·21·86	23	—	.345	65.4	1.45	25.0	5564.4	701.9	[illegible]
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY [signature]

APPROVED BY [signature] DATE [illegible]

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

.COOLER, LINEAR RESONANT CRYOGENIC
DRAWING NO. SM-D-5005842

SERIAL NO. 015

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
10·8·86	-32	—	.347	65.3	1.34	23.5	5326.5	462.0	1315
	-52	—	.285	66.5	1.48	25.9	5330.8	466.3	1730
	23	—	.350	65.0	1.4	24.5		468.8	2000
10·9·86	23	5.8	—	39.6	1.5	26.3	5340.8	476.3	0740
	23	—	.352	64.8	1.42	24.9	5343.5	479.0	1015
	-32	—	.352	64.8	1.35	23.6	5346.7	482.2	1320
	-52	—	.291	65.6	1.48	25.9	5350.7	486.2	1725
10·10·86	23	5.8	—	39.4	1.5	26.3	5360.8	496.3	0740
	23	—	.353	64.3	1.42	24.9	5362.7	498.2	0925
	-32	—	.347	64.6	1.36	23.8	5366.8	502.3	1330
	-52	—	.291	65.6	1.48	25.9	5370.8	506.3	1730
10·13·86	23	5.8	—	39.4	1.51	26.1	5420.8	556.3	0740
	23	—	.351	64.0	1.44	25.2	5422.4	557.9	0905
	-32	—	.344	64.6	1.36	23.8	5426.5	562.0	1310
	38	—	.343	68.2	1.47	25.6	5431.3	566.8	1803
10·14·86	23	5.8	—	39.5	1.52	26.6	5440.8	576.3	0730
	23	—	.349	64.5	1.44	25.2	5442.3	577.8	0905
	-32	—	.344	64.6	1.35	23.6	5447.9	583.4	1330
	-52	—	.290	65.4	1.50	26.3	5450.7	586.2	1725
	23	—	.350	64.8	1.4	24.5		588.8	2000
10·15·86	23	5.8	—	39.1	1.54	27.0	5460.8	596.3	0730
10·15·86	23	—	.351	64.1	1.46	25.6	5462.9	598.4	0935
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY Gwinn V. Galloway

APPROVED BY

DATE 10/15/86

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 015

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
10.1.86	23	—	.350	64.5	1.4	24.5		328.7	2000
10.2.86	23	5.7	—	39.1	1.49	26.1	5200.9	336.4	0740
	23	—	.352	64.7	1.39	24.3	5201.7	337.2	0830
	-32	—	.349	64.6	1.32	23.1	5206.5	342.0	1315
	52	—	.289	65.4	1.42	24.9	5210.9	346.4	1735
10.2.86	23	—	.350	64.1	1.4	24.5		348.8	2000
10.3.86	23	5.7	—	39.2	1.49	26.1	5220.9	356.4	0740
	23	—	.351	64.3	1.41	24.7	5222.4	357.9	0905
	-32	—	.352	64.9	1.33	23.3	5226.5	362.0	1315
	52	—	.291	65.8	1.46	25.6	5230.9	366.4	1735
10.6.86	23	5.7	—	39.6	1.48	25.9	5280.9	416.4	0740
	23	—	.352	64.1	1.40	24.5	5282.5	418.0	0915
	-32	—	.344	64.9	1.33	23.3	5286.5	422.0	
	52	—	.285	65.6	1.46	25.6	5290.8	426.3	1730
10.6.86	23	—	.350	64.6	1.40	24.5		428.8	2000
10.7.86	23	5.8	—	39.3	1.48	25.9	5300.8	436.3	0740
	23	—	.348	65.1	1.40	24.5	5303.2	438.7	0955
	-32	—	.347	65.3	1.33	23.3	5306.5	442.0	1315
	52	—	.286	65.6	1.47	25.7	5310.8	446.3	1730
10.7.86	23	—	.350	65.0	1.40	24.5		448.8	2000
10.8.86	23	5.8	—	39.5	1.49	26.1	5320.8	456.3	0740
10.8.86	23	—	.348	65.0	1.42	24.9	5322.4	457.9	0900
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY Paul V. LaKamp

APPROVED BY

DATE 10-8-86

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC — SERIAL NO. 015

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
9·25·86	23	—	.350	64.8	1.4	24.5		208.8	2600
9·26·86	23	5.9	—	41.6	1.48	25.9	5080.9	216.4	0740
	23	—	.347	66.8	1.35	23.6	5081.6	217.1	0820
	23	—	.348	64.7	1.37	25.3	5083.8	219.3	1030
	-32	—	.348	65.0	1.30	22.8	5086.6	222.1	1320
	-32	—	.348	65.0	1.32	23.1			
	52	—	.288	65.1	1.50	26.3	5090.9	226.4	1730
9·29·86	23	5.8	—	40.5	1.44	25.2	5140.9	276.4	0740
	23	—	.350	64.0	1.39	24.3	5142.3	277.8	0900
	23	—	.350	64.3	1.39	24.3	5143.8	279.3	1030
	-32	—	.351	63.8	1.33	23.3	5146.6	282.1	1320
	52	—	.290	64.5	1.49	26.1	5150.9	286.4	1735
9·29·86	23	—	.350	64.1	1.4	24.5		288.8	2000
9·30·86	23	5.8	—	39.2	1.51	26.4	5160.9	296.4	0740
	23	—	.347	64.1	1.39	24.3	5162.2	297.7	0855
	-32	—	.349	63.8	1.34	23.5	5166.4	301.9	1310
9·30·86	52	—	.289	64.8	1.48	25.9	5170.8	306.3	1730
10·1·86	23	5.7	—	39.1	1.49	26.1	5180.9	316.4	0740
	23	—	.351	64.1	1.42	24.9	5182.1	317.6	0845
	23	—	.351	64.0	1.40	24.5	5183.5	319.0	1015
	-32	—	.350	64.2	1.33	23.3	5186.5	322.0	1315
10-1-86	52		.29	65.0	1.47	25.7	5190.9	326.3	1731
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY _____

APPROVED BY _____ DATE 10-3-86

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 015

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
9.19.86	52	—	.290	66.2	1.42	24.9	4950.7	86.2	1135
9.19.86	23	—	.350	65.9	1.35	23.6		88.8	2000
9.22.86	23	5.8	—	41.1	1.44	25.2	5001.0	136.5	0740
9.22.86	23	-	.349	64.2	1.36	23.8	5002.2	137.7	0900
9.22.86	-32	—	.344	67.4	1.35	23.6	5006.7	142.2	1325
9.22.86	23	—	.350	66.8	1.30	22.8		148.8	2000
9.23.86	23	5.8	—	41.5	1.44	25.2	5021.0	156.5	0740
	23	—	.350	64.6	1.36	23.8	5021.8	157.3	0830
	-32	—	.345	64.3	1.32	23.1	5026.7	162.2	1330
	52	—	.285	66.3	1.43	25.0	5030.9	166.4	1735
9.23.86	23	-	.350	66.6	1.35	23.6		168.8	2000
9.24.86	23	5.3	—	40.6	1.49	26.0	5041.0	176.5	0740
	23	—	.345	64.6	1.36	23.8	5042.3	177.8	0900
	23	—	.346	65.4	1.35	23.6	5044.0	179.5	1035
	-32	-	.345	64.2	1.34	23.5	5046.5	182.0	1315
	52	—	.285	65.5	1.45	25.4	5050.9	186.4	1735
9.24.86	23	-	.350	64.6	1.4	24.5		188.8	2000
9.25.86	23	5.8	—	40.9	1.44	25.2	5060.9	196.4	0740
	23	—	.346	64.9	1.35	23.6	5062.5	198.0	0910
	-32	-	.346	66.7	1.33	23.3	5066.8	202.3	1335
9.25.86	52	—	.289	65.4	1.45	25.4	5070.8	206.3	1730
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY Diane V. McKay

APPROVED BY

DATE 9/26/86

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 015

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
9/15/86	23	5.7	—	—	—	—	4864.5		START OF LIFE TEST
	23	—	.350	63.5	1.3	22.8	4865.3	.8	
	23	—	.350	64.1	1.3	22.8	4866.1	2.1	
	-31	—	.347	63.0	1.3	22.8	4870.3	5.7	
9/15/86	52	—	.291	64.6	1.4	24.5	4874.1	9.6	
9/16/86	23	5.7	—	—	—	—	4884.3	19.8	
	23	—	.353	63.6	1.34	23.5	4884.8	20.3	
	-32	—	.346	61.7	1.29	22.6	4890.0	25.5	
9/16/86	52	—	.290	66.0	1.40	24.5	4894.0	29.5	
9/17/86	23	5.8	—	40.4	—	—	4904.4	39.9	
	23	—	.347	63.5	1.32	23.1	4905.1	40.6	
	-32	—	.343	63.8	1.29	22.6	4910.0	45.5	13:35
9.17.86	52	—	.290	63.1	1.45	25.4	4914.1	49.6	1740
9/17/86	23		.350	63.3	1.35	23.6		51.9	2000
9/18/86	23	5.8	—	41.1	1.42	24.9	4924.4	59.9	0740
	23	—	.351	62.4	1.35	23.6	4925.9	61.4	0910
	-32	—	.342	61.7	1.34	23.5	4930.1	65.6	1325
	52	—	.289	63.0	1.45	25.4	4934.0	69.5	1720
9/18/86	23	—	.350	62.8	1.35	23.6		72.2	2000
9/19/86	23	5.8	—	40.9	1.44	25.2	4941.0	76.5	0740
	23	—	.350	66.0	1.32	23.1	4942.2	77.7	0850
9/19/86	-32	—	.349	63.7	1.31	22.9	4946.7	82.2	1320
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY Diane V. LaBarge

APPROVED BY

DATE 9/19/86

PERFORMANCE TEST

DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC. SERIAL NO. C15
DRAWING NO. SM-D-5005863/SM-D-5005842

TEST PLAN PARA	PARAMETER	MEASURED	UNITS	LIMITS MIN	LIMITS MAX
3.10	Calibration Check		-	Comply	
4.1.1	Inspection to SM-D-5005863/5005842		-	Comply	
4.1.2	Weight	2.34	Lbs	-	2.5
4.1.3.1	Pressurization	330	PSIG	Info	Only
4.1.3.2	Leakage Rate	1.8x10⁻⁹	STP CC/SEC	-	2.7×10^{-7}
4.2.2	Test at 23°C Horiz; Turn-on Current	.95	Amps	Info	
4.2.2	Cooldown Time to 100°K	5.3	Minutes	-	7.5
4.2.2	Cooldown Time to 80°K	6.0	Minutes	-	10
4.2.2	Minimum Temp	39.5	°K	Info	80
4.2.2.1	Stabl. Temp. with 0.35 Watt Heat Load	67.7	°K		80
4.2.2.2	Temp. after 1/2 Hour Operation	67.9	°K	-	80
4.2.2.3	Cold Finger warm end temp	34	°C	Info	Only
4.2.2.4	Input Volt. 17 VDC Current 1.42 ADC Power 24.14	24.1	Watts	-	30
4.2.2.5	Stabl. Temp with 0.35 Watt Heat Load	72.3	°K		80
4.2.2.5	Cold Finger Warm End Temp	34	°C	Info	Only
4.2.2.5	Input Volts 32 VDC Current .77 ADC FB. OK Power 24.6	24.6	Watts	-	30
4.2.3	Test at -40°C Horiz; Turn-on Current	1.05	Amps	Info	
4.2.3.1	Cooldown Time to 100°K	6.6	Minutes	-	7.5
4.2.3.1	Cooldown Time to 80°K	7.3	Minutes	-	10
4.2.3.2	Stabl. Temp with 0.2 Watt Heat Load	46.7	°K	-	80
4.2.3.2	Temp after 1/2 Hour	46.8	°K	-	80
4.2.3.3	Cold Finger Warm End Temp	-31	°C	Info	Only
4.2.3.4	Input Volts 17 VDC Current 1.53 ADC Stablized Power 26.01	26.0	Watts	-	30
4.2.3.5	Temp with 0.2 Watt Head Load	47.3	°K	-	80
4.2.3.5	Cold Finger Warm End Temp	-31	°C	Info	Only
4.2.3.5	Input Volts 32 VDC Current .82 ADC FB. OK Power 26.24	26.2	Watts	-	30
4.2.4	Test at 71°C Horiz; Turn-on Current	1.10	Amps	Info	
4.2.4.1	Cooldown Time to 100°K	5.9	Minutes	-	7.5
4.2.4.1	Cooldown Time to 80°K	6.9	Minutes	-	10
4.2.4.1	Stabl. Temp. with 0.2 Watt Heat Load	69.1	°K	-	80
4.2.4.1	Temp after 1/2 hour	67.2	°K	-	80
4.2.4.2	Cold Finger Warm End Temp	91	°C	Info	Only
4.2.4.3	Input Volts 17 VDC Current 1.52 ADC F.B. O.K. Power [illegible]	25.9	Watts	-	35
4.2.4.4	Stabl. Temp with 0.2 Watt Head Load	55.2	°K	-	80
4.2.4.4	Cold Finger Warm End Temp	92	°C	Info	Only
4.2.4.4	Input Volts 32 VDC Current ADC .75 Power	27.2	Watts	-	35

3.9 in.

PERFORMED BY: [signature]

2/7/86

PERFORMANCE TEST

DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC SERIAL NO. 015
DRAWING NO. SM-D-5005863/SM-D-5005842

TEST PLAN PARA	PARAMETER	MEASURED	UNITS	LIMITS MIN	LIMITS MAX
4.2.5	Test at 23°C Vertical; Turn-on Current	1.0	Amps	Info	
4.2.5.1	Cooldown Time to 100°K	5.3	Minutes	-	7.5
4.2.5.1	Cooldown Time to 80°K	6.1	Minutes	-	10
4.2.5.1	Minimum Temp	39.7	°K		80
4.2.5.2	Stabl. Temp with 0.35 Watt Heat Load	63.4	°K	-	80
4.2.5.3	Temp After 1/2 Hour With Heat Load	68.4	°K	Info	80
4.2.5.4	Cold Finger Warm End Temp	34	°C	Info	Only
4.2.5.5	Input Volts 17 VDC Current 1.37 ADC EB-OK Power 23.29	23.3	Watts	-	30
4.2.5.6	Stabl. Temp. with 0.35 Watt Heat Load	69.4	°K		80
4.2.5.6	Cold Finger Warm End Temp	34	°C	Info	Only
4.2.5.6	Input Volt 32 VDC Current .77 ADC Power 24.64	24.6	Watts	-	30
4.2.6	Leakage Rate	2.3×10^{-7}	STP CC/SEC	-	2.7×10^{-7}

PERFORMED BY [signature] DATE 7/16/86 23°C
7/17/86 -40°C
71°C
23°C

WITNESSED BY [signature] Q.A. MAGNAVOX

WITNESSED BY _____ Q.A. CUSTOMER

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC SERIAL NO. 016

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
1-5-87	23	—	.340	64.2	1.50	26.3	6223.9	1338.8	1050
	-20	—	.338	67.9	1.44	25.2	6226.6	1341.5	1336
	52	—	.282	62.8	1.68	29.4	6230.6	1345.5	1730
1-6-87	20	5.2	—	38.8	1.54	26.95	6241.3	1356.2	0800
	37	—	.340	66.8	1.5	26.2	6242.4	1357.3	0930
	-14	—	.336	65.0	1.41	24.6	6246.5	1361.4	1330
1-7-87	20	5.1	—	38.7	1.55	27.1	6261.4	1376.3	0828
	23	5.0	—	38.8	1.55	27.1	6263.6	1378.5	1257
	-31	—	.340	62.3	1.43	25.0	6266.9	1381.8	1412
1-8-87	20	5.0	—	41.0	1.55	27.1	6281.4	1396.3	0755
	40	—	.344	68.1	1.55	27.1	6293.4	1398.3	0955
	23	—	.342	65.7	1.46	25.6	6284.4	1399.3	1050
	-32	—	.342	72.3	1.40	24.5	62869	1401.8	1325
	52	—	.282	63.4	1.66	29.1	6291.1	1406.0	1730
	23	—	.342	62.1	1.5	26.2	—	—	2000
1-9-87	23	5.	—	39.3	1.58	27.6	6301.6	1416.5	0909
	20	—	.338	64.0	1.50	26.2	6302.8	1417.7	0921
1-9-87	-32	—	.340	380.0	.100	—	6306.8		1320
1-13-87	23	5.0	—	38.5	1.64	28.7	6306.8	1417.7	PH
	52	—	.289	62.4	1.64	28.7	6308.2	1419.1	1735
	20	—	.340	623	1.5	26.25	—	—	2000
1-14-87	20	5.1	—	39.4	1.55		6318.8	1429.7	0816
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY _____

APPROVED BY _____ DATE 1-14-87

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC — SERIAL NO. 016

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
12.18.86	52	—	.284	60.5	1.72	30.1	5871.5	986.8	1730
	23	—	.340	61.2	1.50	26.2	—	—	2000
12-14-86	23	5.0	—	36.8	1.63	28.5	5881.8	997.1	0740 D.M.
	23	—	.340	61.5	1.54	26.9	5883.9	999.2	0935 D.M.
	-32	—	.342	66.9	1.46	25.6	5887.5	1002.8	1330
	52	—	.286	60.8	1.71	29.9	5891.5	1006.8	1730
	23	—	.340	61.2	1.5	26.2	—	—	2000
12-22-86	23	5.1	—	36.4	1.63	29.0	5941.8	1057.1	0740 DM
	23	—	.342	61.5	1.54	26.9	5943.7	1059.0	0945 D.M.
	-32	—	.343	64.3	1.46	25.6	5947.1	1062.4	1330 D.M.
	23	—	.342	62.2	1.50	26.2	—	—	2000
12-23-86	23	—	—	36.7	1.64	28.7	5961.8	1077.1	0750 D.M.
	23	—	.342	61.2	1.54	26.9	5963.5	1076.8	0930 D.M.
	-32	—	.340	64.3	1.46	25.6	5967.3	1082.6	1330 D.M.
	52	—	.283	60.6	1.71	29.9	5971.5	1086.8	1730
12-24-86	23	5.0	—	36.7	1.64	28.7	5981.8	1097.1	0750
	23	—	.343	62.1	1.54	26.9	5983.5	1098.4	0930 D.M.
	-32	—	.338	69.4	1.44	25.2	5987.5	1102.4	1330
1-2-87	40.1	—	—	39.2	1.67	29.2	6161.7	1276.6	0732 MT
	49.8	—	.342	64.6	1.65	28.9	6163.4	1278.3	0923 MT
	-21.6	—	.340	63.6	1.45	25.4	6167.4	1282.3	1330 MT
1-5-86	20.3	5.3	—	37.5	1.65	28.8	6221.7	1336.6	0806 D.M.
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY _____

APPROVED BY _____ DATE 1-8-87

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC — SERIAL NO. 016

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
12-12-86	12	—	.344	61.7			5750.6	865.9	
	TEST STAND SHUT DOWN TO INSTALL INTERLOCK RELAY								
	TEST STAND TURNED ON AT 1630 HRS								
12-13-86	52	—	.279	60.1	1.67	29.2	5751.6	866.9	
12-15-86				41.2	1.62				
	23	—	.334	63.7	1.46	25.6	5803.9	919.2	
	-32	—	.334	62.9	1.47	25.7	5807.6	922.9	
	52	—	.275	60.4	1.71	29.9	5811.6	926.9	
	23	—	.340	60.6	1.61	26.4			2000
12-16-86	23	5.5	—	36.3	1.65	28.8	5821.9	937.2	0740 D.H.
	23	—	.333	60.3	1.55	27.1	5823.4	938.7	0930 D.H.
	-32	—	.332	64.9	1.46	25.5	5827.4	942.7	1330 D.H.
	52	—	.274	59.9	1.74	30.5	5831.4	946.7	1730
	23	—	.333	60.5	1.52	26.6	—	—	2000
12-17-86	23	6.0	—	37.3	1.64	28.7	5841.8	957.1	0740 D.H.
	23	—	.342	61.6	1.54	26.9	5843.4	958.7	0930 D.H.
	-32	—	.343	64.5	1.47	25.7	5847.9	963.2	1355
	52	—	.285	61.4	1.71	29.9	5851.6	966.9	1730
	23	—	.340	63.5	1.5	26.2			
12-18-86	23	5.0	—	36.2	1.63	28.5	5861.8	977.1	0740 D.H.
	23	—	.343	61.1	1.54	26.9	5864.0	979.3	0959 D.H.
12-18-86	-32	—	.342	64.6	1.45	25.4	5867.3	982.6	1320
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY _____

APPROVED BY _____ DATE 12-19-86

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC — SERIAL NO. 016

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
12-5-86	52	—	.271	60.8	1.74	30.5	5618.7	734.0	1730
	23	—	.340	61.8	1.52	26.6			
Fuse was blown → 12-4-86	23	5.0	—	36.5	1.64	28.7	5669.1	784.4	0740 D.M.
12-8-86	23	4.9	—	36.8	1.62	29.3	5670.2	785.5	1050 D.M.
	0	—	.338	62.3	1.46	25.5	5674.8	790.1	1546 D.M.
	52	—	.277	62.1	1.73	30.3	5677.1	792.4	1730
	23	—	.340	62.7	1.52	26.6			2000
12-9-86	23	5.1	—	39.4	1.54	26.9	5687.4	802.7	0740 D.M.
	23	—	.340	66.4	1.47	25.7	5688.9	804.2	0930 D.M.
	-32	—	.342	67.8	1.41	24.7	5693.1	808.4	1327
	52	—	.280	67.8	1.62	28.4	5697.1	812.4	1730
	23	—	.340	636	1.5	26.25			2000
12-10-86	23	5.0	—	37.1	1.65	28.8	5707.4	822.7	0740 D.M.
	23	—	.346	62.4	1.54	27.0	5709.0	824.3	0930 D.M.
	-32	—	.339	67.7	1.5	26.25	5712.1	825.4	1330 D.M.
	52	—	.277	62.1	1.74	30.5	5717.1	832.4	1730
	23	—	.340	63.1	1.50	26.25			2000
12-11-86	23	5.1	—	39.3	1.64	28.7	5727.4	842.7	0740 D.M.
	23	—	.345	62.8	1.54	26.9	5729.0	844.3	0930 D.M.
	-32	—	.340	64.3	1.46	25.5	5732.8	848.1	1330 D.M.
	23	—	.340	63.1	1.50	26.2			2000
12-12-86	23	5.0	—	36.9	1.65	28.8	5747.4	862.7	0740 D.M.
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY _____

APPROVED BY _____ DATE 12-19-86

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 016

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
11-26-86	23	—	.100	44.9	1.54	26.9			2000
12-1-86	23	5.0	—	36.3	1.66	29.0	5528.9	644.8	0740 D.M.
	23	—	.336	61.2	1.56	27.3	5530.7	646.6	0930 D.M.
	-32	—	.340	65.7	1.43	25.0	5534.9	650.8	1330 D.M.
	52	—	.280	60.8	1.72	30.1	5538	654.7	1735
	23	—	.340	61.9	1.52	26.6			2000 D.M.
12-2-86	23	5.0	—	35.9	1.63	29.5	5549.9	664.8	0740 D.M.
	-32	—	.340	65.2	1.47	25.7	5554.8	670.7	1330 D.M.
	52	—	.276	61.8	1.70	29.8	5558.7	674.6	1730
	23		.340	61.8	1.50	26.3			2000
12-3-86	23	5.0	—	38.0	1.58	27.7	5568.9	684.8	0740 MT
	23	—	.340	62.0	1.55	27.1	5571.1	687.0	0955 MT
	-32	—	.336	67.6	1.45	25.4	5574.6	690.5	1330 MT
	52	—	.274	61.3	1.74	30.5	5578.6	694.5	1730
12-4-86	23	5.0	—	36.2	1.62	28.4	5588.9	704.8	0735 MT
	23	—	.339	62.1	1.53	26.8	5591.1	707	0955 MT
	32	—	.341	66.0	1.45	25.4	5594.6	710.5	1330
	52	—	.275	62.5	1.70	29.8	5598.7	714.6	1730
	23		.340	63.3	1.50	26.3			2000
12-5-86	23	5.0	—	36.5	1.64	28.7	5608.9	724.2	0735 MT
	23	—	.342	61.8	1.55	26.4	5611.0	726.3	0930 MT
	32	—	.336	66.4	1.47	25.7	5614.6	729.9	1330 MT
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY _____

APPROVED BY _____ DATE 12-8-86

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC — SERIAL NO. 016

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
11-19-86	-32	—	.342	66.9	1.47	25.7	5294.6	410 6	1335
	52	—	.280	62.5	1.70	29.8	5298.8	414.8	1735
11-20-86	23	5.0	—	38.3	1.62	28.3	5308.8	424.8	0740
	23	—	.349	62.0	1.55	27.1	5310.7	426.7	0930
	-32	—	.339	65.0	1.50	26.3	5314.7	430.7	1330
	52	—	.276	62.1	1.72	30.1	5318.7	434.7	1730
	23	—	.333	62.3	1.54	27.0	5321.8	437.8	2030
11-21-86	23	5.1	—	38.1	1.65	28.9	5329.0	445.0	0740
	23	—	.335	62.1	1.56	27.3	5330.7	446.7	0930
	-32	—	.332	67.1	1.48	25.9	5334.7	450.7	1330
	52	—	.286	61.2	1.73	30.3	5338.7	454.7	1730
11-24-86	23	5.0	—	37.6	1.64	28.7	5349.0	505.	0740
	23	—	.339	62.7	1.55	27.1	5390.7	506.7	0930
	-32	—	.346	66.8	1.48	25.9	5394.7	510.7	1330
11-25-86	23	5.0	—	39.0	1.69	29.5	5409.0	525.0	0740
	23	—	.336	63.0	1.56	27.3	5410.7	526.7	0930
	-32	—	.337	65.9	1.46	25.5	5415.4	531.3	1330
	40	—	282	60.5	1.59	276	5417.3	533.2	1630
11-26-86	23	5.0	—	37.6	1.66	29.0	5429.0	544.9	0740
	23	—	.339	61.9	1.56	27.3	5430.7	546.6	0925
	-32	—	.337	64.6	1.48	26.9	5434.6	550.5	1330
11-26-86	52	—	.274	61.2	1.74	30.5	5438.5	554.4	1730
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY _____

APPROVED BY _____ DATE 11-26-86

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC

SERIAL NO. 016

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
11-12-86	52	—	.277	57.9	1.76	30.8	5155.4	271.4	1740
11.12-86	23	—	.350	58.7	1.52	26.6		273.7	2000
11-13-86	23	5.0	—	35.7	1.62	28.4	5169.4	285.4	0746
	23	—	.353	58.6	1.55	27.1	5170.9	286.9	0930
	-32	—	.341	60.9	1.52	26.6	5174.9	290.9	1330
	52	—	.277	58.4	1.75	30.6	5179.0	295.0	1730
11.13.86	23	-	.350	58.7	1.52	26.6		297.5	2000
11.14.86	23	5.0	—	35.0	1.53	26.8	5189.2	305.2	0745
	23	—	.346	58.4	1.56	27.3	5190.9	306.9	0930
	-32	—	.338	61.3	1.52	26.6	5194.7	310.7	1315
	52	—	.275	58.4	1.75	30.6	5199.1	315.1	1740
11.14.86	23	—	.350	58.7					2000
11.15.86	17	5-8	—	34.6	1.64	28.7	5212.2		1100
11-17-86	23	5.1	—		1.58	27.65	5249.4	365.4	0801 PM
	23	—	.341	60.8	1.55	27.1	5251.1	367.1	0955
	-32	—	.342	64.0	1.47	25.7	5254.8	370.8	1335
11.17.86	52	—	.285	60.3	1.72	30.1	5258.7	374.7	1730
11.18.86	23	—	.350	60.3	1.55	27.1	5271.0	387.0	0950
	-32	—	.338	68.1	1.47	25.7	5274.8	390.8	1335
	52	—	.273	61.7	1.74	30.5	5278.7	394.7	1730
11-19-86	23	5.0	—	37.9	1.68	28.5	5289.9	404.9	0744 B.M
11.19.86	23	—	.351	62.5	1.55	27.1	5291.1	407.1	0955
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY _____

APPROVED BY _____ DATE 11-19-86

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC — SERIAL NO. 016

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
11·6·86	23	5.0	—	47.8	1.61	28.2	5034.0	150.0	0748
	23	—	.353	57.8	1.55	27.1	5036.1	152.1	0955
	-32	—	.344	60.5	1.54	27.0	5039.6	155.6	1320
11·6·86	52	—	.342	62.6	1.72	30.1	5043.9	159.9	1740
11·7·86	23	5.0	—	38.6	1.64	28.7	5054.0	170.0	0748
	23	—	.351	57.9	1.57	27.5	5055.7	171.7	0930
	-32	—	.341	60.8	1.53	26.8	5059.4	175.4	1345
11·7·86	23	—	.350	59.3	1.51	26.4		182.2	2000
11·10·86	23	5.0	—	38.7	1.64	28.7	5114.0	230.0	0746
	23	—	.353	58.7	1.57	27.5	5115.7	231.7	0930
	-32	—	.342	61.2	1.56	27.3	5119.7	235.7	1330
11·10·86	52	—	.280	58.0	1.80	31.5	5124.1	240.1	1750
11·11·86	23	5.0	—	37.9	1.64	28.7	5134.3	250.3	0805
	23	—	.339	58.5	1.57	27.5	5135.6	251.6	0920
	-32	—	.345	61.8	1.54	27.0	5139.7	255.7	1330
	52	—	.280	58.4	1.52	26.6		259.7	1730
11·11·86	23	—	.350	58.3	1.52	26.6		262.2	2000
11·12·86							5154.1	270.1	
	S/N 016 REMOVED FROM LIFE TEST FOR ACOUSTIC NOISE TESTING.								
11·12·86	23	5.1	—	34.4	1.63	28.5	5154.1	270.1	1620
11·12·86									
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY _____

APPROVED BY _____ DATE 11-12-86

Magnavox
ELECTRO-OPTICAL SYSTEMS

MM&T
LIFE TEST
DATA SHEET

COOLER, LINEAR RESONANT CRYOGENIC — SERIAL NO. 016

DRAWING NO. SM-D-5005842

DATE	AMB TEMP °C	TIME TO 80°K MINUTES	HEAT LOAD WATTS	COLD STATION °K	COOLER INPUT CURRENT AMPS	COOLER POWER WATTS @17.5VDC	ETI READING	CUM HOURS	INITIALS
10.30.86	23	5.0	—	37.4	1.58	27.7	4884.0	START OF LIFETEST	0950
	23	—	.351	60.1	1.44	25.2	4884.7	0.7	1025
	-32	—	.348	66.4	1.56	27.3	4887.7	3.7	1330
	52	—	.273	60.4	1.66	29.1	4891.7	7.7	1730
10.30.86	23	—	.350	62.2	1.55	27.1		10.2	2000
10.31.86	23	4.9	—	39.6	1.60	28.0	4901.9	17.9	0741
	23	—	.347	59.4	1.54	27.0	4903.7	19.7	0930
	-32	—	.340	63.9	1.54	27.0	4907.6	23.1	1320
	52	—	.276	59.9	1.66	29.1	4911.9	27.4	1740
11.3.86	23	—	—	36.3	1.64	28.7	4973.9	89.9	0739
	23	—	.358	60.8	1.52	26.6	4975.7	91.7	0930
	-32	—	.339	64.5	1.53	26.8	4979.5	95.5	1315
11.3.86	52	—	.297	60.3	1.69	29.6	4983.7	99.7	1730
11.4.86	23	5.0	—	42.7	1.58	27.7	4994.0	110.0	0749
	23	—	.351	61.7	1.53	26.8	4995.8	111.8	0935
	-32	—	.344	69.6	1.50	26.3	4999.7	115.7	1330
11.4.86	52	—	.289	60.2	1.70	29.8	5003.8	119.8	1735
11.5.86	23	5.0	—	40.3	1.56	27.3	5014.1	130.1	0749
	23	—	.355	60.2	1.52	26.6	5015.7	131.7	0930
	-32	—	.355	63.3	1.52	26.6	5019.9	135.9	1335
	52	—	.276	59.5	1.70	29.8	5023.9	139.9	1740
11.5.86	23	—	.350	60.5	1.51	26.4		142.2	2000
SPEC	INFO ONLY	10 MIN @ 23°C	.208: -32° .280: 23° .232: 52° MIN	80°K MAX	1.72A MAX @ 17.5V	30 WATTS MAX	INFO ONLY	INFO ONLY	

PERFORMED BY Daniel V. Lukanyi

APPROVED BY

DATE 11/5/86

Magnavox
ELECTRO-OPTICAL SYSTEMS
P.O. BOX 615, 40 INDUSTRIAL AVENUE, FAIRFIELD, N.J. 07006-0615
TEL: 201-575-1700 TWX: 710-988-5672

Contract No. DAAK20-84-C-0440 PERFORMANCE TEST

Project No. 24407 DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC SERIAL NO. 016

DRAWING NO. SM-D-5005842

TEST PLAN PARA	PARAMETER	MEASURED	UNITS	LIMITS MIN	LIMITS MAX
3.10	Calibration Check	COMPLY	-	Comply	
4.1.1	Inspection to SM-D-5005842	COMPLY	-	Comply	
4.1.2	Weight	2.35	Lbs	-	2.5
4.1.3.1	Pressurization	330	PSIG	Info	Only
4.1.3.2	Leakage Rate	6.0×10^{-9}	STP CC/SEC	-	2.7×10^{-7}
4.2.2	Test at 23°C Horiz; Turn-on Current	N/A	Amps	Info	
4.2.2	Cooldown Time to 100°K	4.2	Minutes	-	7.5
4.2.2	Cooldown Time to 80°K	4.9	Minutes	-	10
4.2.2	Minimum Temp	35.5	°K	Info	80
4.2.2.1	Stabl. Temp. with 0.35 Watt Heat Load	59.5	°K		80
4.2.2.2	Temp. after 1/2 Hour Operation	61.0	°K	-	80
4.2.2.3	Cold Finger warm end temp	39	°C	Info	Only
4.2.2.4	Input Volt 17 VDC Current 1.42 ADC Power	24.14	Watts	-	30
4.2.2.5	Stabl. Temp with 0.35 Watt Heat Load	63.1	°K		80
4.2.2.5	Cold Finger Warm End Temp	39	°C	Info	Only
.2.2.5	Input Volts 32 VDC Current .88 ADC Power	28.16	Watts	-	30
4.2.3	Test at -40°C Horiz; Turn-on Current	N/A	Amps	Info	
4.2.3.1	Cooldown Time to 100°K	3.8	Minutes	-	7.5
4.2.3.1	Cooldown Time to 80°K	4.1	Minutes	-	10
4.2.3.2	Stabl. Temp with 0.2 Watt Heat Load	49.3	°K	-	80
4.2.3.2	Temp after 1/2 Hour	49.2	°K	-	80
4.2.3.3	Cold Finger Warm End Temp	-30	°C	Info	Only
4.2.3.4	Input Volts 17 VDC Current 1.16 ADC Stablized Power	21.82	Watts	-	30
4.2.3.5	Temp with 0.2 Watt Head Load	50.7	°K	-	80
4.2.3.5	Cold Finger Warm End Temp	-30	°C	Info	Only
4.2.3.5	Input Volts 32 VDC Current .86 ADC Power	27.52	Watts	-	30
4.2.4	Test at 71°C Horiz; Turn-on Current	N/A	Amps	Info	
4.2.4.1	Cooldown Time to 100°K	4.7	Minutes	-	7.5
4.2.4.1	Cooldown Time to 80°K	5.5	Minutes	-	10
4.2.4.1	Stabl. Temp. with 0.2 Watt Heat Load	60.0	°K	-	80
4.2.4.1	Temp after 1/2 hour	65.0	°K	-	80
4.2.4.2	Cold Finger Warm End Temp	89	°C	Info	Only
4.2.4.3	Input Volts 17 VDC Current 1.73 ADC Power	29.41	Watts	-	35
4.2.4.4	Stabl. Temp with 0.2 Watt Head Load	63.2	°K	-	80
4.2.4.4	Cold Finger Warm End Temp	89	°C	Info	Only
4.2.4.4	Input Volts 32 VDC Current ADC 1.02 Power	32.64	Watts	-	35

Performed By: P. HARTMANN Date: 10-23-86

Witnessed By: [signature] B-1 Q. A. Magnavox

Witnessed By: [signature] 31 OCT Q. A. Customer

Magnavox
ELECTRO-OPTICAL SYSTEMS
P.O. BOX 619, 46 INDUSTRIAL AVENUE, MAHWAH, N.J. 07430-0619
TEL: 201-529-1700 · TWX: 710-988-5672

Contract: DAAK20-84-C-0440 PERFORMANCE TEST

Project: 24407 DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC SERIAL NO. 016
DRAWING NO. SM-D-5005842

TEST PLAN PARA	PARAMETER	MEASURED	UNITS	LIMITS MIN	LIMITS MAX
4.2.5	Test at 23°C Vertical; Turn-on Current	N/A	Amps	Info	
4.2.5.1	Cooldown Time to 100°K	4.1	Minutes	-	7.5
4.2.5.1	Cooldown Time to 80°K	4.7	Minutes	-	10
4.2.5.1	Minimum Temp	35.5	°K		80
4.2.5.2	Stabl. Temp with 0.35 Watt Heat Load	59.2	°K	-	80
4.2.5.3	Temp After 1/2 Hour With Heat Load	60.1	°K	Info	80
4.2.5.4	Cold Finger Warm End Temp	32	°C	Info	Only
4.2.5.5	Input Volts 17 VDC Current 1.49 ADC Power	25.33	Watts	-	30
4.2.5.6	Stabl. Temp. with 0.35 Watt Heat Load	62.5	°K		80
4.2.5.6	Cold Finger Warm End Temp	33	°C	Info	Only
4.2.5.6	Input Volt 32 VDC Current .89 ADC Power	28.48	Watts	-	30
4.2.6	Leakage Rate	6.0×10^{-9}	STP CC/SEC	-	2.7×10^{-7}

PERFORMED BY P. HARTMANN DATE 10-24-86

WITNESSED BY [signature] Q.A. MAGNAVOX

WITNESSED BY [signature] Q.A. CUSTOMER

31 OCT 1986

APPENDIX C

FAILURE REPORTS

Magnavox
GOVERNMENT & INDUSTRIAL ELECTRONICS COMPANY
RELIABILITY & QUALITY ASSURANCE DEPT.

F.R. No. 24407-002

FAILURE REPORT

Name & Type	Part or Dwg. No.	Serial No.	Circuit Symbol	Manufacturer
Equipment: COOLER, LINEAR SPLIT CYCLE, HD-1045V/UA	SM-D-5005842	011		MAGIEC: MAGNAVOX
Assembly				
Part				

Test Environment	Spec No.	Data Sheet Item No.
-32 C Life Test	EOSR 1314	

Failure Date	9-26-86
Report Date	10-16-86
Customer	NVEOC
Contract No.	DAAK20-84-C-0440
Project No.	24407
Running Time	217 Hours

DESCRIPTION OF FAILURE (Include Symptoms, readings, deviations from Specs) On Returns: quote Customer complaint; describe MAGIEC test findings

On September 25, 1986 after 202 hours of operation the coldfinger temperature had risen to 81.6K at -32 C ambient. The cooler had been operating with a full specification heat load of .350 watts, not the 80% load allowed for life test. The heat load was then changed to the life test 80% load, and the cooler was operated for another day. The coldfinger temperature was then 72.5 K at 23 C ambient with a heat load of .280 watts. Although this is still within the life test limits, Magnavox felt this early degradation of performance is not, and cannot be accepted as, typical of our coolers. Accordingly, the cooler was removed from life test at 217 hours of operation.

CAUSE OF FAILURE: A combination of gas contamination, contamination of the regenerator, and fit of the regenerator/coldfinger: Part numbers SM-C-5005937 and SM-C-5005939.

REPAIR ACTION

The unit was purged and recharged. The Displacer Assembly (SM-C-5005937) and the Cold finger Cylinder Assembly (SM-C-5005939) were replaced.

Disposition of removed part: Scrapped

Failure Found During: Acceptance Test ☐ Design Approval Test ☐ Reliability Test ☐ Field Use ☐ Other Life Test

Reported by	Reviewed by (Engineering)	Project Manager	Quality Assurance
	Ram Narayan		

FAILURE ANALYSIS REPORT 2-27-87

ANALYSIS : The following steps were taken in determining the cause for the degradation in performance:

1. The performance found during life test was confirmed in the cryogenics engineering lab. (See data, Attachment 1).
2. The cooler was taken to a gas analysis lab to have the gas analyzed, since the symptoms hinted at the possibility of gas contamination. (See Attachment 2).

   The gas analysis indicated a helium purity of slightly over 98%. This is significantly less than the 99.999% purity that Magnavox uses in charging its coolers.

3. Based on the results of the gas analysis in 2. above; the cooler was vacuum baked, purged, charged, and then run through a performance test. Cooler performance improved, but not significantly. (See data attachment 3). This left other causes to be explored to determine the cause for loss in cold production.

Cont'd./2..

C-1

Analysis by	Engineering	Project Manager	Quality Assurance	Date
	Ram Narayan			3/17/87

Copies: J. R. Casamento, S. Cacioppo, R. Christiansen, D. Coffin, W. Galbo, D. Lehrfeld, R. Naravan, W. Schubert. Contracts: J. Lynch (3)
NVEOC: H. Dunmire, S. Pomeroy. DCAS: R. Rothstein

ANALYSIS (Cont'd..)

4. The expander was then disassembled; and the regenerator was removed. The pieces were examined and cleaned of a minimal amount of accumulated particulates. The unit was then re-assembled and retested with no improvement in performance. (See data, Attachment 4). The cooler did not meet the performance requirements.

5. The coldfinger assembly was again removed, and a coldfinger and displacer from another unit were then fitted to the compressor of SN 11. The test results indicated the cooler met the specification performance requirements with a comfortable margin. (See data Attachment 5).

6. The coldfinger and regenerator removed from SN 11 were inspected dimensionally. The coldfinger was within specification requirements. The regenerator dimensions indicated a clearance to the coldfinger wall greater than the design limits.

7. The SN 11 regenerator rulon was removed; new rulon was applied and remachined.

8. SN 11 compressor was then tested using its original coldfinger and regenerator, with the remachined rulon. Cooler performance met the specification requirements, but with little margin, which is not typical. (See data, Attachment 6).

9. A new coldfinger and regenerator were then fitted to SN 11. The unit was subjected to and passed a full acceptance test, and then returned to the life test. (See ATP data, Attachment 7).

10. In order to substantiate gas impurity as a contributing factor in this situation; an attempt was made to duplicate the gas impurity level found in the analysis of SN 11. Cooler SN 13 was evacuated to -7 psi to maintain the impurity level measured during the gas analysis. (Refer to Attachment 2) and then charged and tested. The performance was somewhat similar to that of SN 11. (See data, Attachment 8).

Based on the steps taken, it is concluded that the following separate factors contributed to the degradation in cold production of SN 11:

a) Gas contamination

b) Partial contamination of the regenerator

c) Poor regenerator rulon/coldfinger fit.

CORRECTIVE ACTION:

a) Gas contamination: The contamination in the gas of SN 11 is felt to be the result of an improper technique. Incomplete purging prior to charging the cooler was likely. The procedures to be followed have been made more detailed and operators retrained, removing the need for esoteric judgements on the part of the operators.

b) Partial Contamination of the Regenerator: When the coldfinger was disassembled, a small amount of particles was observed. These were predominantly the wear products from the regenerator clearance seal. Particles and other contaminants that entered the original displacer were easily be trapped within the regenerator mesh, making it impossible to clean completely. This contributed to the poor cooler performance after initial reassembly.

CORRECTIVE ACTION (Cont'd..)

c) Poor Regenerator Rulon/Cold finger Fit: It is believed, after reviewing events with assembly personnel, that the assembly of the origiual SN 11 coldfinger was accomplished using a burnishing procedure on the displacer rulon. It is felt that excessive burnishing during this procedure left only a minimal amount of material at a few high spots to affect a seal. Hence the rapid degradation in performance and early accumulation of particles. Manufacturing process sheets have been prepared which clearly define the step-by-step assembly technique and highlights the fact that burnishing is no longer to be performed. Once regenerator/coldfinger dimensions are within drawing requirements, no other fitting actions are required nor permitted. The regenerator/coldfinger assembly presently in SN 11 were assembled using the latter technique.

As of the date of this final report: February 27, 1987, cooler SN 11 has accumulated 2,530 hours of failure-free operation.

No other action is deemed necessary regarding this report.

TEST AFTER PULL OUT OF LIFE TEST CHAMBER

(1)

ATTACHMENT NO. 1 Sheet 1 of 2

PERFORMANCE TEST

DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC SERIAL NO. 011
DRAWING NO. SM-D-5005863/SM-D-5005842

TEST PLAN PARA	PARAMETER	MEASURED	UNITS	LIMITS MIN	LIMITS MAX
3.10	Calibration Check		-	Comply	
4.1.1	Inspection to SM-D-5005863/5005842		-	Comply	
4.1.2	Weight		Lbs	-	2.5
4.1.3.1	Pressurization	330	PSIG	Info	Only
4.1.3.2	Leakage Rate	$2.x10^{-7}$	STP CC/SEC	-	$2.7x10^{-7}$
4.2.2	Test at 23°C Horiz; Turn-on Current	—	Amps	Info	
4.2.2	Cooldown Time to 100°K	5.1	Minutes	-	7.5
4.2.2	Cooldown Time to 80°K	6.0	Minutes	-	10
4.2.2	Minimum Temp	57.7	°K	Info	80
4.2.2.1	Stabl. Temp. with 0.35 Watt Heat Load	77.8	°K		80
4.2.2.2	Temp. after 1/2 Hour Operation	77.6	°K	-	80
4.2.2.3	Cold Finger warm end temp	35	°C	Info	Only
4.2.2.4	Input Volt 17.5 VDC Current 1.42 ADC Power	24.85	Watts	-	30
~~4.2.2.5~~	~~Stabl. Temp with 0.35 Watt Heat Load~~		~~K~~		~~80~~
~~4.2.2.6~~	~~Cold Finger Warm End Temp~~		~~°C~~	~~Info~~	~~Only~~
~~4.2.2.5~~	~~Input Volts 32 VDC Current ADC~~ Power		~~Watts~~		~~30~~
4.2.3	Test at -32 C Horiz; Turn-on Current	—	Amps	Info	
4.2.3.1	Cooldown Time to 100°K	5.3	Minutes	-	7.5
4.2.3.1	Cooldown Time to 80°K	6.3	Minutes	-	10
4.2.3.2	Stabl. Temp with 350 Watt Heat Load	84.4	°K	-	80
4.2.3.2	Temp after 1/2 Hour	84.5	°K	-	80
4.2.3.3	Cold Finger Warm End Temp	-20	°C	Info	Only
4.2.3.4	Input Volts 17.5 VDC Current 1.25 ADC Stablized Power	21.875	Watts	-	30
~~4.2.3.5~~	~~Temp with 0.2 Watt Heat Load~~		~~°K~~		~~80~~
~~4.2.3.6~~	~~Cold Finger Warm End Temp~~		~~°C~~	~~Info~~	~~Only~~
~~4.2.3.5~~	~~Input Volts 32 VDC Current ADC~~ Power		~~Watts~~		~~30~~
4.2.4	Test at 52 Horiz; Turn-on Current	—	Amps	Info	
4.2.4.1	Cooldown Time to 100°K	5.5	Minutes	-	7.5
4.2.4.1	Cooldown Time to 80°K	6.5	Minutes	-	10
4.2.4.1	Stabl. Temp. with 280 Watt Heat Load	75.6	°K	-	80
4.2.4.1	Temp after 1/2 hour	75.7	°K	-	80
4.2.4.2	Cold Finger Warm End Temp	67	°C	Info	Only
4.2.4.3	Input Volts 17.5 VDC Current 1.55 ADC Power	21.125	Watts	-	35
~~4.2.4.4~~	~~Stabl. Temp with 0.2 Watt Heat Load~~		~~°K~~		~~80~~
~~4.2.4.5~~	~~Cold Finger Warm End Temp~~		~~°C~~	~~Info~~	~~Only~~
~~4.2.4.4~~	~~Input Volts 32 VDC Current ADC~~ Power		~~Watts~~		~~35~~

SEE BACK

PERFORMED BY: P HARTMANN
DATE: 1-29-86
WELDED YES/NO: Yes

ATTACHMENT NO. 1 Page 2 of 2

PERFORMANCE TEST

DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC SERIAL NO. 011
DRAWING NO. SM-D-5005863/SM-D-5005842

TEST PLAN PARA	PARAMETER	MEASURED	UNITS	LIMITS MIN	LIMITS MAX
4.2.5	Test at 23°C Vertical; Turn-on Current		Amps	Info	
4.2.5.1	Cooldown Time to 100°K	5.0	Minutes	-	7.5
4.2.5.1	Cooldown Time to 80°K	5.8	Minutes	-	10
4.2.5.1	Minimum Temp	49.1	°K		80
4.2.5.2	Stabl. Temp with 0.35 Watt Heat Load	77.3	°K	-	80
4.2.5.3	Temp After 1/2 Hour With Heat Load	77.4	°K	Info	80
4.2.5.4	Cold Finger Warm End Temp	39	°C	Info	Only
4.2.5.5	Input Volts 17.5 VDC Current 1.42 ADC Power	24.85	Watts	-	30
~~4.2.5.6~~	~~Stabl. Temp with 0.35 Watt Heat Load~~		°K		~~80~~
~~4.2.5.6~~	~~Cold Finger Warm End Temp~~		°C	~~Info~~	~~Only~~
~~4.2.5.6~~	~~Input Volts 27 VDC Current ADC~~		-		
	~~Power~~		~~Watts~~		~~30~~
4.2.6	Leakage Rate		STP CC/SEC	-	$2.7X10^{-7}$

49.1 - 53.2 °K

PERFORMED BY P HARTMANN DATE 9-29-86

WITNESSED BY _____ Q.A. MAGNAVOX

WITNESSED BY _____ Q.A. CUSTOMER

4.2.3	Test at -32°C Horiz Turn-on Current		Amps	Info	
4.2.3.1	Cooldown Time to 100°K	4.9	Min	-	7.5
4.2.3.1	Cooldown Time to 80°K	6.0	Min	-	10
4.2.3.2	Stabl. Temp with 0.250 WATT Heat load	71.5	°K	-	80
4.2.3.2	Temp after 1/2 hour	73.3	°K	-	80
4.2.3.3	Cold Finger Warm End Temp	-20	°C	Info	Only
4.2.3.4	Input Volts 17.5 vdc Current .79 ADC			-	30
	Min. Temp	62.3	°K		

B 82

C-5

ATTACHMENT NO. 2 SHEET 1 OF 2

Gollob Analytical Service

MOLININI/GOLLOB A DIVISION OF ENSECO INCORPORATED
47 INDUSTRIAL ROAD, BERKELEY HEIGHTS, NEW JERSEY 07922 • TEL. (201) 464-3331

TO Mr. Ram Narayan, Ph.D.
Magnavox
46 Industrial Avenue
Mahwah, NJ 07430

G.A.S. REPORT No. 61985
Date Requested: 10/2/86
Date Reported: 10/3/86
P.O. No. S4727

MATERIAL SUBMITTED: 1 (One) Cooler

INFORMATION REQUESTED: Mass Spectrometry & Gas Chromatography Analyses

NOTEBOOK REFERENCE: 1207, Pg. 18

RESULT OF INVESTIGATION

All data are presented in the attached table.

n 10386

By _____
GOLLOB ANALYTICAL SERVICE

ATTACHMENT NO. 2 SHEET 2

THIS IS G.A.S. NO. 61985

CONCENTRATION, PER CENT BY VOLUME

P/N - SM-D 5005842
S/N - 011

NITROGEN	1.40
OXYGEN	.25
ARGON	.0190
CARBON DIOXIDE	.0165
HYDROGEN	ND
HELIUM	98 +
ORGANICS	ND
WATER *	.0012

TOTAL AMT. OF GAS,cc 2200

* PERFORMED BY ELECTROLYTIC HYGROMETER

ND=NONE DETECTED,LESS THAN .0004

The mass spectrometer was scanned from mass 2 to mass 150 and no other constituents were detected. The detection threshold for most constituents is .0004 per cent.

The temperature of the sample was maintained at room temperature during analysis.

LIFE-TEST UNIT

NEW GAS ATTACHMENT NO. 3 Sheet 1 of 2

BAKED, PURGED, CHARGED PERFORMANCE TEST

(3)

DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC SERIAL NO. 011
DRAWING NO. SM-D-5005863/SM-D-5005842

TEST PLAN PARA	PARAMETER	MEASURED	UNITS	LIMITS MIN	LIMITS MAX
3.10	Calibration Check		-	Comply	
4.1.1	Inspection to SM-D-5005863/5005842		-	Comply	
4.1.2	Weight		Lbs	-	2.5
4.1.3.1	Pressurization	330	PSIG	Info	Only
4.1.3.2	Leakage Rate	7.5×10^{-9}	STP CC/SEC	-	2.7×10^{-7}
4.2.2	Test at 23°C Horiz; Turn-on Current		Amps	Info	
4.2.2	Cooldown Time to 100°K	5.7	Minutes	-	7.5
4.2.2	Cooldown Time to 80°K	6.5	Minutes	-	10
4.2.2	Minimum Temp	48.3	°K	Info	80
4.2.2.1	Stabl. Temp. with 0.35 Watt Heat Load	75.8	°K		80
4.2.2.2	Temp. after 1/2 Hour Operation	76.4	°K	-	80
4.2.2.3	Cold Finger warm end temp	33	°C	Info	Only
4.2.2.4	Input Volt 17 VDC Current 1.43 ADC Power	24.31	Watts	-	30
4.2.2.5	Stabl. Temp with 0.35 Watt Heat Load	78.8	°K		80
4.2.2.5	Cold Finger Warm End Temp	34	°C	Info	Only
4.2.2.5	Input Volts 32 VDC Current .81 ADC Power	25.92	Watts	-	30
.2.3	Test at -40°C Horiz; Turn-on Current		Amps	Info	
4.2.3.1	Cooldown Time to 100°K	6.3	Minutes	-	7.5
4.2.3.1	Cooldown Time to 80°K	7.7	Minutes	-	10
4.2.3.2	Stabl. Temp with 0.2 Watt Heat Load		°K	-	80
4.2.3.2	Temp after 1/2 Hour	99.2	°K	-	80
4.2.3.3	Cold Finger Warm End Temp	-33	°C	Info	Only
4.2.3.4	Input Volts 17 VDC Current 1.24 ADC Stablized Power		Watts	-	30
4.2.3.5	Temp with 0.2 Watt Head Load	101.8	°K	-	80
4.2.3.5	Cold Finger Warm End Temp	-33	°C	Info	Only
4.2.3.5	Input Volts 32 VDC Current .72 ADC Power		Watts	-	30
4.2.4	Test at 71°C Horiz; Turn-on Current		Amps	Info	
4.2.4.1	Cooldown Time to 100°K	6.3	Minutes	-	7.5
4.2.4.1	Cooldown Time to 80°K	7.4	Minutes	-	10
4.2.4.1	Stabl. Temp. with 0.2 Watt Heat Load	68.9 ↑	°K	-	80
4.2.4.1	Temp after ~~1/2~~ hour overnight	70.9	°K	-	80
4.2.4.2	Cold Finger Warm End Temp	82	°C	Info	Only
4.2.4.3	Input Volts 17 VDC Current 1.67 ADC Power	28.39	Watts	-	35
4.2.4.4	Stabl. Temp with 0.2 Watt Head Load	71.9	°K	-	80
4.2.4.4	Cold Finger Warm End Temp	82	°C	Info	Only
4.2.4.4	Input Volts 32 VDC Current ADC .96 Power	30.72	Watts	-	35

PERFORMED BY: P. HOFFMANN
DATE: 10-6-86 - 10-7-86
WELDED YES/NO: Yes Qual Unit

ATTACHMENT NO. 3 Page 2 of 2

PERFORMANCE TEST

DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC SERIAL NO. 011
DRAWING NO. SM-D-5005863/SM-D-5005842

TEST PLAN PARA	PARAMETER	MEASURED	UNITS	LIMITS MIN	LIMITS MAX
4.2.5	Test at 23°C Vertical; Turn-on Current		Amps	Info	
4.2.5.1	Cooldown Time to 100°K	5.6	Minutes	-	7.5
4.2.5.1	Cooldown Time to 80°K	6.5	Minutes	-	10
4.2.5.1	Minimum Temp	44.9	°K		80
4.2.5.2	Stabl. Temp with 0.35 Watt Heat Load		°K	-	80
4.2.5.3	Temp After 1/2 Hour With Heat Load	73.0	°K	Info	80
4.2.5.4	Cold Finger Warm End Temp	33	°C	Info	Only
4.2.5.5	Input Volts 17 VDC Current 1.44 ADC Power ____	24.48	Watts	-	30
4.2.5.6	Stabl. Temp. with 0.35 Watt Heat Load	75.9	°K		80
4.2.5.6	Cold Finger Warm End Temp	33	°C	Info	Only
4.2.5.6	Input Volt 32 VDC Current .83 ADC Power ____	26.56	Watts	-	30
4.2.6	Leakage Rate		STP CC/SEC	-	$2.7X10^{-7}$

PERFORMED BY P. HARTMANN DATE 10-6-86 - 10-7-86

WITNESSED BY _____ Q.A. MAGNAVOX

WITNESSED BY _____ Q.A. CUSTOMER

ATTACHMENT No. 4

PERFORMANCE TEST

DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC SERIAL NO. 011
DRAWING NO. SM-D-5005863/SM-D-5005842

TEST PLAN PARA	PARAMETER	MEASURED	UNITS	LIMITS MIN	LIMITS MAX
4.2.5	Test at 23°C Vertical; Turn-on Current		Amps	Info	
4.2.5.1	Cooldown Time to 100°K	5.8	Minutes	-	7.5
4.2.5.1	Cooldown Time to 80°K	6.6	Minutes	-	10
4.2.5.1	Minimum Temp	43.1	°K		80
4.2.5.2	Stabl. Temp with 0.35 Watt Heat Load	73.2	°K	-	80
4.2.5.3	Temp After 1/2 Hour With Heat Load	73.2	°K	Info	80
4.2.5.4	Cold Finger Warm End Temp	32	°C	Info	Only
4.2.5.5	Input Volts 17 VDC Current 1.45 ADC Power ____	24.65	Watts	-	30
4.2.5.6	Stabl. Temp. with 0.35 Watt Heat Load	74.7	°K		80
4.2.5.6	Cold Finger Warm End Temp	32	°C	Info	Only
4.2.5.6	Input Volt 32 VDC Current .84 ADC Power ____	26.88	Watts	-	30
4.2.6	Leakage Rate		STP CC/SEC	-	$2.7X10^{-7}$

PERFORMED BY P. HARTMANN DATE 10-9-86

WITNESSED BY _____ Q.A. MAGNAVOX

WITNESSED BY _____ Q.A. CUSTOMER

TEST AFTER CLEANING W/ ORIGINAL C.F.

ATTACHMENT NO. 5

Sheet 1

PERFORMANCE TEST

DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC — SERIAL NO. 011
DRAWING NO. SM-D-5005863/SM-D-5005842 — W/ C.F. FROM S/N 016

TEST PLAN PARA	PARAMETER	MEASURED	UNITS	LIMITS MIN	LIMITS MAX
3.10	Calibration Check		-	Comply	
4.1.1	Inspection to SM-D-5005863/5005842		-	Comply	
4.1.2	Weight		Lbs	-	2.5
4.1.3.1	Pressurization	330	PSIG	Info	Only
4.1.3.2	Leakage Rate	1.5×10^{-8}	STP CC/SEC	-	2.7×10^{-7}
4.2.2	Test at 23°C Horiz; Turn-on Current	N/A	Amps	Info	
4.2.2	Cooldown Time to 100°K	3.7	Minutes	-	7.5
4.2.2	Cooldown Time to 80°K	4.3	Minutes	-	10
4.2.2	Minimum Temp	36.0	°K	Info	80
4.2.2.1	Stabl. Temp. with 0.35 Watt Heat Load		°K		80
4.2.2.2	Temp. after 1/2 Hour Operation	65.6	°K	-	80
4.2.2.3	Cold Finger warm end temp	—	°C	Info	Only
4.2.2.4	Input Volt 17 VDC Current 1.50 ADC Power	25.5	Watts	-	30
4.2.2.5	Stabl. Temp with 0.35 Watt Heat Load	—	°K		80
4.2.2.5	Cold Finger Warm End Temp	—	°C	Info	Only
4.2.2.5	Input Volts 32 VDC Current ____ ADC Power ____	—	Watts	-	30
4.2.3	Test at -40°C Horiz; Turn-on Current	N/A	Amps	Info	
4.2.3.1	Cooldown Time to 100°K		Minutes	-	7.5
4.2.3.1	Cooldown Time to 80°K	3.5	Minutes	-	10
4.2.3.2	Stabl. Temp with 0.2 Watt Heat Load	4.1	°K	-	80
4.2.3.2	Temp after 1/2 Hour	49.2	°K	-	80
4.2.3.3	Cold Finger Warm End Temp	—	°C	Info	Only
4.2.3.4	Input Volts 17 VDC Current 1.40 ADC Stablized Power	23.8	Watts	-	30
4.2.3.5	Temp with 0.2 Watt Head Load	—	°K	-	80
4.2.3.5	Cold Finger Warm End Temp	—	°C	Info	Only
4.2.3.5	Input Volts 32 VDC Current ____ ADC Power ____	—	Watts	-	30
4.2.4	Test at 71°C Horiz; Turn-on Current	N/A	Amps	Info	
4.2.4.1	Cooldown Time to 100°K	4.3	Minutes	-	7.5
4.2.4.1	Cooldown Time to 80°K	5.1	Minutes	-	10
4.2.4.1	Stabl. Temp. with 0.2 Watt Heat Load		°K	-	80
4.2.4.1	Temp after 1/2 hour	64.0	°K	-	80
4.2.4.2	Cold Finger Warm End Temp	—	°C	Info	Only
4.2.4.3	Input Volts 17 VDC Current 1.71 ADC Power ____	29.1	Watts	-	35
4.2.4.4	Stabl. Temp with 0.2 Watt Head Load	—	°K	-	80
4.2.4.4	Cold Finger Warm End Temp	—	°C	Info	Only
4.2.4.4	Input Volts 32 VDC Current ADC — Power ____	—	Watts	-	35

Min Temp - 41.0°C

PERFORMED BY: S. CACIOPPO
DATE: 10-15-86
WELDED YES/NO: YES

New Run On Seal

ATTACHMENT NO. 6

Sheet 1

(10)

PERFORMANCE TEST

DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC — SERIAL NO. 011
DRAWING NO. SM-D-5005863/SM-D-5005842

TEST PLAN PARA	PARAMETER	MEASURED	UNITS	LIMITS MIN	LIMITS MAX
3.10	Calibration Check	-	-	Comply	
4.1.1	Inspection to SM-D-5005863/5005842		-	Comply	
4.1.2	Weight		Lbs	-	2.5
4.1.3.1	Pressurization	330	PSIG	Info	Only
4.1.3.2	Leakage Rate		STP CC/SEC	-	2.7×10^{-7}
4.2.2	Test at 23°C Horiz; Turn-on Current		Amps	Info	
4.2.2	Cooldown Time to 100°K	4.9	Minutes	-	7.5
4.2.2	Cooldown Time to 80°K	5.8	Minutes	-	10
4.2.2	Minimum Temp	46.8	°K	Info	80
4.2.2.1	Stabl. Temp. with 0.35 Watt Heat Load	73	°K		80
4.2.2.2	Temp. after 1/2 Hour Operation	75.1	°K	-	80
4.2.2.3	Cold Finger warm end temp	32.	°C	Info	Only
4.2.2.4	Input Volt 17 VDC Current 1.44 ADC Power	24.48	Watts	-	30
4.2.2.5	Stabl. Temp with 0.35 Watt Heat Load	77.4	°K		80
4.2.2.5	Cold Finger Warm End Temp	132	°C	Info	Only
4.2.2.5	Input Volts 32 VDC Current .84 ADC Power	26.88	Watts	-	30
4.2.3	Test at -40°C Horiz; Turn-on Current		Amps	Info	
4.2.3.1	Cooldown Time to 100°K	3.9	Minutes	-	7.5
4.2.3.1	Cooldown Time to 80°K	4.7	Minutes	-	10
4.2.3.2	Stabl. Temp with 0.2 Watt Heat Load	53.7	°K	-	80
4.2.3.2	Temp after 1/2 Hour	52.9	°K	-	80
4.2.3.3	Cold Finger Warm End Temp	-33	°C	Info	Only
4.2.3.4	Input Volts 17 VDC Current 1.42 ADC Stablized Power	24.14	Watts	-	30
4.2.3.5	Temp with 0.2 Watt Head Load	55.9	°K	-	80
4.2.3.5	Cold Finger Warm End Temp	-35	°C	Info	Only
4.2.3.5	Input Volts 32 VDC Current .81 ADC Power	25.92	Watts	-	30
4.2.4	Test at 71°C Horiz; Turn-on Current		Amps	Info	
4.2.4.1	Cooldown Time to 100°K	6.5	Minutes	-	7.5
4.2.4.1	Cooldown Time to 80°K	7.9	Minutes	-	10
4.2.4.1	Stabl. Temp. with 0.2 Watt Heat Load	75.5	°K	-	80
4.2.4.1	Temp after 1/2 hour	76.1	°K	-	80
4.2.4.2	Cold Finger Warm End Temp	74	°C	Info	Only
4.2.4.3	Input Volts 17 VDC Current 1.69 ADC Power	28.73	Watts	-	35
4.2.4.4	Stabl. Temp with 0.2 Watt Head Load	80.9	°K	-	80
4.2.4.4	Cold Finger Warm End Temp	80	°C	Info	Only
4.2.4.4	Input Volts 32 VDC Current ADC 1.03 Power	32.96	Watts	-	35

Min. Temp

PERFORMED BY: T. HARTMANN, D. MASTRASARIO

DATE: 10-21-86

WELDED YES/NO: YES

Magnavox
ELECTRO-OPTICAL SYSTEMS
P.O. Box 619, 40 Industrial Avenue, Mahwah, N.J. 07430-0619
TEL: 201-529-1700 TWX: 710-988-5572

ATTACHMENT No. 7

Sheet 1 of 2

Contract No. DAAK20-84-C-0440

PERFORMANCE TEST

Project No. 24407

DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC SERIAL NO. 011
DRAWING NO. SM-D-5005842

TEST PLAN PARA	PARAMETER	MEASURED	UNITS	LIMITS MIN	LIMITS MAX
3.10	Calibration Check	COMPLY	-	Comply	
4.1.1	Inspection to SM-D-5005842	COMPLY	-	Comply	
4.1.2	Weight	2.35	Lbs	-	2.5
4.1.3.1	Pressurization	330	PSIG	Info	Only
4.1.3.2	Leakage Rate	1.6×10^{-8}	STP CC/SEC	-	2.7×10^{-7}
4.2.2	Test at 23°C Horiz; Turn-on Current	N/A	Amps	Info	
4.2.2	Cooldown Time to 100°K	4.7	Minutes	-	7.5
4.2.2	Cooldown Time to 80°K	5.5	Minutes	-	10
4.2.2	Minimum Temp	15.2	°K	Info	80
4.2.2.1	Stabl. Temp. with 0.35 Watt Heat Load	68.0	°K		80
4.2.2.2	Temp. after 1/2 Hour Operation	69.7	°K	-	80
4.2.2.3	Cold Finger warm end temp	37	°C	Info	Only
4.2.2.4	Input Volt 17 VDC Current 1.47 ADC Power	24.99	Watts	-	30
4.2.2.5	Stabl. Temp with 0.35 Watt Heat Load	71.9	°K		80
4.2.2.5	Cold Finger Warm End Temp	37	°C	Info	Only
4.2.2.5	Input Volts 32 VDC Current .87 ADC Power	27.84	Watts	-	30
4.2.3	Test at -40°C Horiz; Turn-on Current	N/A	Amps	Info	
4.2.3.1	Cooldown Time to 100°K	4.2	Minutes	-	7.5
4.2.3.1	Cooldown Time to 80°K	4.9	Minutes	-	10
4.2.3.2	Stabl. Temp with 0.2 Watt Heat Load	55.4	°K	-	80
4.2.3.2	Temp after 1/2 Hour	55.7	°K	-	80
4.2.3.3	Cold Finger Warm End Temp	-31	°C	Info	Only
4.2.3.4	Input Volts 17 VDC Current 1.40 ADC Stablized Power	23.80	Watts	-	30
4.2.3.5	Temp with 0.2 Watt Head Load	57.5	°K	-	80
4.2.3.5	Cold Finger Warm End Temp	-31	°C	Info	Only
4.2.3.5	Input Volts 32 VDC Current .83 ADC Power	24.56	Watts	-	30
4.2.4	Test at 71°C Horiz; Turn-on Current	N/A	Amps	Info	
4.2.4.1	Cooldown Time to 100°K	5.5	Minutes	-	7.5
4.2.4.1	Cooldown Time to 80°K	6.5	Minutes	-	10
4.2.4.1	Stabl. Temp. with 0.2 Watt Heat Load	64.2	°K	-	80
4.2.4.1	Temp after 1/2 hour	61.1	°K	-	80
4.2.4.2	Cold Finger Warm End Temp	8.5	°C	Info	Only
4.2.4.3	Input Volts 17 VDC Current 1.57 ADC Power	26.69	Watts	-	35
4.2.4.4	Stabl. Temp with 0.2 Watt Head Load	71.9	°K	-	80
4.2.4.4	Cold Finger Warm End Temp	8.5	°C	Info	Only
4.2.4.4	Input Volts 32 VDC Current ADC .99 Power	31.68	Watts	-	35

Performed By: P. HARTMANN Date: 10-23-86

Witnessed By: C-13 Q. A. Magnavox

Witnessed By: 21 OCT 1986 Q. A. Customer

Magnavox
ELECTRO-OPTICAL SYSTEMS
P.O. BOX 615, 46 INDUSTRIAL AVENUE, MAHWAH, N.J. 07430-0615
TEL: 201-529-1700 TWX: 710-988-5672

ATTACHMENT No 7 Page 2 of 2

Contract: DAAK20-84-C-0440 PERFORMANCE TEST

Project: 24407 DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC SERIAL NO. 011
DRAWING NO. SM-D-5005842

TEST PLAN PARA	PARAMETER	MEASURED	UNITS	LIMITS MIN	LIMITS MAX
4.2.5	Test at 23°C Vertical; Turn-on Current	N/A	Amps	Info	
4.2.5.1	Cooldown Time to 100°K	4.7	Minutes	-	7.5
4.2.5.1	Cooldown Time to 80°K	5.4	Minutes	-	10
4.2.5.1	Minimum Temp	44.8	°K		80
4.2.5.2	Stabl. Temp with 0.35 Watt Heat Load	64.6	°K	-	80
4.2.5.3	Temp After 1/2 Hour With Heat Load	70.6	°K	Info	80
4.2.5.4	Cold Finger Warm End Temp	39	°C	Info	Only
4.2.5.5	Input Volts 17 VDC Current 1.44 ADC Power	24.48	Watts	-	30
4.2.5.6	Stabl. Temp. with 0.35 Watt Heat Load	73.2	°K		80
4.2.5.6	Cold Finger Warm End Temp	39	°C	Info	Only
4.2.5.6	Input Volt 32 VDC Current .87 ADC Power	24.48	Watts	-	30
4.2.6	Leakage Rate	2.5×10^{-7}	STP CC/SEC	-	2.7×10^{-7}

PERFORMED BY P. HARTMANN DATE 10-21-86

WITNESSED BY [signature] Q.A. MAGNAVOX

WITNESSED BY [signature] Q.A. CUSTOMER OCT 1986

ATTACHMENT NO. 8 Sheet 1 of 4

PERFORMANCE TEST

CONTAMINATED GAS DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC SERIAL NO. 013
DRAWING NO. SM-D-5005863/SM-D-5005842

TEST PLAN PARA	PARAMETER	MEASURED	UNITS	LIMITS MIN	LIMITS MAX
3.10	Calibration Check		-	Comply	
4.1.1	Inspection to SM-D-5005863/5005842		-	Comply	
4.1.2	Weight		Lbs	-	2.5
4.1.3.1	Pressurization	330	PSIG	Info	Only
4.1.3.2	Leakage Rate	—	STP CC/SEC	-	2.7×10^{-7}
4.2.2	Test at 23°C Horiz; Turn-on Current	—	Amps	Info	
4.2.2	Cooldown Time to 100°K	5.4	Minutes	-	7.5
4.2.2	Cooldown Time to 80°K	6.3	Minutes	-	10
4.2.2	Minimum Temp	56.7	°K	Info	80
4.2.2.1	Stabl. Temp. with 0.35 Watt Heat Load	76.2	°K		80
4.2.2.2	Temp. after 1/2 Hour Operation	89.4	°K	-	80
4.2.2.3	Cold Finger warm end temp		°C	Info	Only
4.2.2.4	Input Volt [redacted] Current 1.75 ADC 10.2 Power	17.85	Watts	-	30
4.2.2.5	Stabl. Temp with 0.35 Watt Heat Load		°K		80
4.2.2.5	Cold Finger Warm End Temp		°C	Info	Only
4.2.2.5	Input Volts 32 VDC Current ADC Power		Watts	-	30
4.2.3	Test at -40°C Horiz; Turn-on Current	—	Amps	Info	
4.2.3.1	Cooldown Time to 100°K	5.0	Minutes	-	7.5
4.2.3.1	Cooldown Time to 80°K	5.7	Minutes	-	10
4.2.3.2	Stabl. Temp with 0.2 Watt Heat Load	66.3	°K	-	80
4.2.3.2	Temp after 1/2 Hour	65.1	°K	-	80
4.2.3.3	Cold Finger Warm End Temp	-29.4	°C	Info	Only
4.2.3.4	Input Volts [redacted] Current 2.35 ADC Stablized 9.6 Power	22.56	Watts	-	30
4.2.3.5	Temp with 0.2 Watt Head Load		°K	-	80
4.2.3.5	Cold Finger Warm End Temp		°C	Info	Only
4.2.3.5	Input Volts 32 VDC Current ADC Power		Watts	-	30
4.2.4	Test at 71°C Horiz; Turn-on Current	—	Amps	Info	
4.2.4.1	Cooldown Time to 100°K	6.3	Minutes	-	7.5
4.2.4.1	Cooldown Time to 80°K	7.6	Minutes	-	10
4.2.4.1	Stabl. Temp. with 0.2 Watt Heat Load	78.4	°K	-	80
4.2.4.1	Temp after 1/2 hour	79.1	°K	-	80
4.2.4.2	Cold Finger Warm End Temp	84.2	°C	Info	Only
4.2.4.3	Input Volts [redacted] Current 1.58 ADC 10.6 Power	16.75	Watts	-	35
4.2.4.4	Stabl. Temp with 0.2 Watt Head Load		°K	-	80
4.2.4.4	Cold Finger Warm End Temp		°C	Info	Only
4.2.4.4	Input Volts 32 VDC Current ADC Power		Watts	-	35

OK

PERFORMED BY: P. Hartmann
DATE: 1-13-87
WELDED YES/NO: No

ATTACHMENT NO. 8 Page 2 of 4

CONTAMINATED GAS

PERFORMANCE TEST

DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC SERIAL NO. 013
DRAWING NO. SM-D-5005863/SM-D-5005842

TEST PLAN PARA	PARAMETER	MEASURED	UNITS	LIMITS MIN	LIMITS MAX
4.2.5	Test at 23°C Vertical; Turn-on Current		Amps	Info	
4.2.5.1	Cooldown Time to 100°K	5.6	Minutes	-	7.5
4.2.5.1	Cooldown Time to 80°K	6.5	Minutes	-	10
4.2.5.1	Minimum Temp	55.0	°K		80
4.2.5.2	Stabl. Temp with 0.35 Watt Heat Load	77.5	°K	-	80
4.2.5.3	Temp After 1/2 Hour With Heat Load	84.2	°K	Info	80
4.2.5.4	Cold Finger Warm End Temp		°C	Info	Only
4.2.5.5	Input Volts [redacted] VDC Current 1.73 ADC (10.2) Power		Watts	-	30
4.2.5.6	Stabl. Temp. with 0.35 Watt Heat Load		°K		80
4.2.5.6	Cold Finger Warm End Temp		°C	Info	Only
4.2.5.6	Input Volt 32 VDC Current ADC Power		Watts	-	30
4.2.6	Leakage Rate		STP CC/SEC	-	$2.7X10^{-7}$

PERFORMED BY P. Hartmann DATE 1-13-87

WITNESSED BY _____ Q.A. MAGNAVOX

WITNESSED BY _____ Q.A. CUSTOMER

CONTAMINATED GAS

ATTACHMENT NO. 8

PERFORMANCE TEST

DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC — SERIAL NO. 013
DRAWING NO. SM-D-5005863/SM-D-5005842

TEST PLAN PARA	PARAMETER	MEASURED	UNITS	LIMITS MIN	LIMITS MAX
3.10	Calibration Check		-	Comply	
4.1.1	Inspection to SM-D-5005863/5005842		-	Comply	
4.1.2	Weight		Lbs	-	2.5
4.1.3.1	Pressurization	330	PSIG	Info	Only
4.1.3.2	Leakage Rate		STP CC/SEC	-	2.7×10^{-7}
4.2.2	Test at 23°C Horiz; Turn-on Current		Amps	Info	
4.2.2	Cooldown Time to 100°K	4.7	Minutes	-	7.5
4.2.2	Cooldown Time to 80°K	5.5	Minutes	-	10
4.2.2	Minimum Temp	59.2→65.1	°K	Info	80
4.2.2.1	Stabl. Temp. with 0.35 Watt Heat Load	77.7	°K		80
4.2.2.2	Temp. after 1/2 Hour Operation	77.9	°K	-	80
4.2.2.3	Cold Finger warm end temp	39.3	°C	Info	Only
4.2.2.4	Input Volts [redacted] Current 1.58 ADC 10.2 Power	16.12	Watts	-	30
4.2.2.5	[redacted]				
4.2.2.5					
4.2.2.5					
4.2.3	Test at -40°C Horiz; Turn-on Current		Amps	Info	
4.2.3.1	Cooldown Time to 100°K	4.5	Minutes	-	7.5
4.2.3.1	Cooldown Time to 80°K	5.1	Minutes	-	10
4.2.3.2	Stabl. Temp with 0.2 Watt Heat Load	66.1	°K	-	80
4.2.3.2	Temp after 1/2 Hour	65.4	°K	-	80
4.2.3.3	Cold Finger Warm End Temp	-33.3	°C	Info	Only
4.2.3.4	Input Volts [redacted] Current 1.81 ADC Stablized 9.6 Power	17.38	Watts	-	30
4.2.3.5	[redacted]				
4.2.3.5					
4.2.3.5					
4.2.4	Test at 71°C Horiz; Turn-on Current		Amps	Info	
4.2.4.1	Cooldown Time to 100°K	5.8	Minutes	-	7.5
4.2.4.1	Cooldown Time to 80°K	6.9	Minutes	-	10
4.2.4.1	Stabl. Temp. with 0.2 Watt Heat Load	75.4	°K	-	80
4.2.4.1	Temp after 1/2 hour	76.3	°K	-	80
4.2.4.2	Cold Finger Warm End Temp	85.9	°C	Info	Only
4.2.4.3	Input Volts [redacted] Current 1.87 ADC 10.6 Power	19.82	Watts	-	35
4.2.4.4	[redacted]				
4.2.4.4					
4.2.4.4					

MIN TEMP 41°K → 59.5°K

RUN TEMP 63[redacted]K

PERFORMED BY: P. HARTMANN
DATE: 1-14-87
WELDED YES/NO: No

CONTAMINATED GIT

ATTACHMENT NO. 8 Page 4 of 4

PERFORMANCE TEST

DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC SERIAL NO. 013
DRAWING NO. SM-D-5005863/SM-D-5005842

TEST PLAN PARA	PARAMETER	MEASURED	UNITS	LIMITS MIN	LIMITS MAX
4.2.5	Test at 23°C Vertical; Turn-on Current	———	Amps	Info	
4.2.5.1	Cooldown Time to 100°K	4.8	Minutes	-	7.5
4.2.5.1	Cooldown Time to 80°K	5.5	Minutes	-	10
4.2.5.1	Minimum Temp	59.2-61.6	°K		80
4.2.5.2	Stabl. Temp with 0.35 Watt Heat Load	75.5	°K	-	80
4.2.5.3	Temp After 1/2 Hour With Heat Load	76.8	°K	Info	80
4.2.5.4	Cold Finger Warm End Temp	31.6	°C	Info	Only
4.2.5.5	Input Volts [redacted]C Current 1.59 ADC 10.2 Power ———	16.22	Watts	-	30
4.2.5.6	[redacted]				
4.2.5.6	[redacted]				
4.2.5.6	[redacted]				
4.2.6	Leakage Rate		STP CC/SEC	-	$2.7X10^{-7}$

PERFORMED BY P. HARTMANN DATE 1-14-87

WITNESSED BY _____ Q.A. MAGNAVOX

WITNESSED BY _____ Q.A. CUSTOMER

Magnavox
GOVERNMENT & INDUSTRIAL ELECTRONICS COMPANY
RELIABILITY & QUALITY ASSURANCE DEPT.

F.R. No. 24407-003

FAILURE REPORT

Name & Type	Part or Dwg. No.	Serial No.	Circuit Symbol	Manufacturer
Equipment: COOLER, LINEAR SPLIT CYCLE, HD-1045	SM-D-5005842	016		MAGIEC: MAGNAVOX
Assembly				
Part				

Failure Date	11-6-86
Report Date	12-1-86
Customer	NVEOC
Contract No.	DAAK20-84-C-0440
Project No.	24407

Test Environment	Spec No.	Data Sheet Item No.	Running Time
52 C Life Test	EOSR 1314		160 Hours

DESCRIPTION OF FAILURE (Include Symptoms, readings, deviations from Specs) On Returns: quote Customer complaint; describe MAGIEC test finding

At 160 hours of operation in the life test, while at the 52 C plateau, input power to SN 016 exceeded the specification limit of 30 watts. Input power was 30.1 watts.

CAUSE OF FAILURE

See analysis.

REPAIR ACTION

See analysis.

Disposition of removed part

Failure Found During: Acceptance Test ☐ Design Approval Test ☐ Reliability Test ☐ Field Use ☐ Other .....

Reported by	Reviewed by (Engineering)	Project Manager	Quality Assurance
	Ram Narayan		

FAILURE ANALYSIS REPORT

ANALYSIS : Although the power specification requirement was exceeded, this cannot be defined as a failure in the typical sense. While the input power was slightly above the limit, the cold production was exceptionally good. (It should be noted that the full specification heat load was used, and not the 80% load allowed for the life test). A tabulation of input power versus cold production at 52 C ambient is presented in Figure 1.

It is easily understood how this condition was not detected during acceptance testing. Acceptance test, high temperature plateau is 71 C, with an input power limit of 35 watts. No testing is required at the 52 C life test temperature, therefore, the marginal power condition at 52 C was masked. The cooler was tested for and passed all the acceptance test temperature requirements.

In the setup of the cooler drive voltage, during the initial manufacturing/assembly tests; the goal is to achieve a balance between cold production and power consumption. Had the marginal power at 52°C been detected earlier, this condition could have been easily corrected opening the cooler and making an internal adjustment setup. Unfortunately to open and adjust the cooler at this point in time is not easy to accomplish; nor is it realistically necessary or desirable.

Analysis by	Engineering	Project Manager	Quality Assurance	Date
	Ram Narayan		W. Galbo	3/17/87

Copies: J. R. Casamento, S. Cacioppo, R. Christiansen, D. Coffin, W. Galbo, D. Lehrfeld, R. Narayan, W. Schubert. Contracts: J. Lynch (3)
NVEOC: H. Dunmire, S. Pomeroy. DCAS: R. Rothstein

Analysis (Cont'd..)

As of this date, Dec. 1, 1986, the cooler has over 665 hours of operation. The amount by which the power exceeded the requirement is minimal. With normal operational variations, the power drifts in and out of the specification limit, as shown in Figure 1.

A review of the data and circumstances leads to a conclusion that this anomaly is the result of a marginal adjustment technique during the assembly test phase, and is not relevant as a design failure in the life test. It is therefore recommended that this not be considered a chargeable failure and that SN 016 be continued in life test.

OPERATING HOURS	CF TEMP DEG K	INPUT POWER WATTS	APPLIED HEAT LOAD WATTS
8	60.4	29.1	.290
27	59.9	29.1	*
100	60.3	29.6	*
120	60.3	29.8	*
140	59.5	29.8	*
160	62.6	30.1	*
240	58.0	31.5	*
260	58.4	26.6	*
271	57.9	30.8	*
295	58.4	30.6	*
315	58.4	30.6	*
375	60.3	30.1	*
395	61.7	30.5	*
415	62.5	29.8	*
435	62.1	30.1	*
455	61.2	30.3	*
555	61.2	30.5	*
655	60.8	30.1	.290

FIGURE 1: SN 016 TIME/CF TEMP/INPUT POWER AT 52 C AMBIENT

CORRECTIVE ACTION

Not applicable at this time.

Magnavox
GOVERNMENT & INDUSTRIAL ELECTRONICS COMPANY
RELIABILITY & QUALITY ASSURANCE DEPT.

FAILURE REPORT

F.R. No. 24407-005

Name & Type	Part or Dwg. No.	Serial No.	Circuit Symbol	Manufacturer
Equipment: COOLER, LINEAR SPLIT CYCLE, HD-1045	SM-D-5005842	016		MAGNAVOX
Assembly: ELECTRONICS ASSEMBLY	SM-D-5005849	007		MAGNAVOX
Part: INVERTER HYBRID	SM-A-5005947	013		TELEDYNE

Test Environment	Spec No.	Data Sheet Item No.
-32 C LIFE TEST	EOSR 1314	

Failure Date	1-9-87
Report Date	3-17-87
Customer	NVEOC
Contract No.	DAAK20-84-C-0440
Project No.	24407
Running Time	1417 Hours

DESCRIPTION OF FAILURE (Include Symptoms, readings, deviations from Specs) On Returns: quote Customer complaint; describe MAGIEC test findings

At 1417 hours of operation in the life test, while at the -32C plateau, input power to SN 016 was observed to be extremely low. The cooler was not operating.
The input current was .1 amperes. (Power: 1.8 watts). Normal input current was approximately 1.5 amperes at this temperature. (Power: 26.2 watts).

CAUSE OF FAILURE

Electronics Assembly, PN SM-D-5005849 had become inoperative. An intermittent wire bond connection on the Inverter Hybrid section (part number SM-A-5005947) of the Electronics Assembly.

REPAIR ACTION : The compressor rear cap was cut open and the electronics package was removed for troubleshooting. The Inverter Hybrid was taken to a hybrid manufacturing laboratory to have the lead rebonded. Two other bonds looked marginal; they were rebonded as well, for good measure.

Disposition of removed part

Failure Found During: Acceptance Test ☐ Design Approval Test ☐ Reliability Test ☐ Field Use ☐ Other _____

Reported by	Reviewed by (Engineering)	Project Manager	Quality Assurance
	Ram Narayan		

FAILURE ANALYSIS REPORT

ANALYSIS : The initial condition observed at the -32 C plateau was confirmed in the cryogenics engineering test area. Many trials at room temperature and then low temperature were made. The cooler functioned at room, but not at cold. During one of the cycles, while at room temperature, the cooler was rapped mechanically, and the problem reappeared. This brought to light the fact that mechanical shock as well as temperature cycling could cause the effect. This immediately raised the flag of a possible loose or poor connection.

The electronics package was then given a thorough microscopic inspection. The inspection revealed one lead was unbonded on the Inverter Hybrid. The services of a nearby hybrid manufacturing lab were enlisted to rebond the lead. During the rebonding, two other leads on the inverter appeared to have marginal bonds, they were also rebonded as a precautionary measure. After rebonding the leads, and re-installing the electronics assembly in the cooler, the cooler was subjected to several temperature cycles (23 C, -32 C, 23 C) without a single failure. It is therefore concluded that the cause of the failure was the poor wire bond connection.

Cont'd../2

Analysis by	Engineering	Project Manager	Quality Assurance	Date
	Ram Narayan			10/23/87

Copies: D. Coffin, R. Day, W. Galbo, S. Isgro, D. Lehrfeld, F. Mollo, R. Narayan.
NVEOC: H. Dunmire, S. Pomeroy. DCAS: R. Rothstein.

QEF 501 (10-7810)

F.R. No. 24407-005

CORRECTIVE ACTION:

Since this was one of the early, engineering assembled, hybrids it is felt the problem was caused by incompletely defined cleaning procedures, bonding process schedule, and defluxing processes. The engineering lab, due to the developmental/design oriented nature of their operation; the necessary rework, trial and retrial of components and techniques, does not always produce a product consistent with the high quality provided by the production department. Every operation in the production department is completely documented and controlled. Bonding schedules, assembly and cleaning processes are fully evaluated before implementation. All these highly disciplined activities along with 100% visual inspection, and source inspection are routinely accomplished by the vendor's production facility. Accordingly, there is no further corrective action required, since all future units will come out of the production group.

Magnavox
GOVERNMENT & INDUSTRIAL ELECTRONICS COMPANY
RELIABILITY & QUALITY ASSURANCE DEPT.

FAILURE REPORT

F.R. No. 24407-006

Name & Type	Part or Dwg. No.	Serial No.	Circuit Symbol	Manufacturer
Equipment: Cooler, Linear Split Cycle, HD-1045	SM-D-5005842	011	-	Magnavox
Assembly: Piston Rulon Assembly	SM-C-5005853	-	-	Magnavox
Part				

Test Environment	Spec No.	Data Sheet Item No.
-32 C Life Test	EOSR 1314	

Failure Date: 9-30-87
Report Date: 2-8-88
Customer: CNVEO
Contract No.: DAAK20-84-C-0440
Project No.: 24407
Running Time: 6435 Hou

DESCRIPTION OF FAILURE (Include Symptoms, readings, deviations from Spec) On Returns: quote Customer complaint: describe MAGIEC test find

The cooler had been placed into life test on October 24, 1986. It had been subjected tc continuous cyclical operation in accordance with the profile of Figure 1. The cooler provided in-spec operation for approximately 2500 hours at -32 C and 23 C. At 2500 hours the input power was 30.1 watts at -32 C, and 30.3 watts at 23 C. The input power at 52 C was 30.1 watts at 1210 hours. This was discussed with CNVEO representatives, and with their concurrence, the test continued. (The marginal power condition is the result of ar assembly/test adjustment which balances power consumption versus cold production). The cooler was operating in full cooling mode, not using the fold-back (refrigeration control mode). The cooler continued to run in full cooling mode, maintaining less than 80 K colc station temperature, with the life test heat load. (For plots of the data, and heat loads used, see Figures 2 through 4). Input power increased to a maximum of 35.9 watts (52 (plateau) at 4550 hours. At 4596 hours, using the refrigeration control mode, the cooler was brought to virtual specification performance:

AMB TEMP	VDC	I	WATTS	COLD TIP K	HEATLOAD MW
23C	17.5	1.72	30.1	80.0	280
-32C	17.5	1.66	29.1	80.5	280
52C	17.5	1.88	32.9	80.2	232

Beyond 4600 hours, cold finger temperature and power rose steadily and could not be brought into spec with the fold-back (refrigeration control) circuit. It was decided, with CNVEO concurrence, to run the cooler beyond this point for informational purposes. On September 30, 1987 after 6435 hours of operation, the cold finger temperature had risen to 111 K and the input power to the cooler was 50.8 watts, at -32 C ambient. The cooler had been operating with the specified heat load of .280 watts. It was felt any further operation of the cooler would not provide additional useful data. Accordingly, the cooler was removec from life test at 6435 hours of operation. Figures 2 through 4 are plots of the cooler performance data over the nearly 6500 hour life test.

CAUSE OF FAILURE:

Post-test analysis revealed that performance degradation resulted from increase in th clearance space between the piston rulon (part No. SM-C-5005853) and the inner yoke bore (part No. SM-D-5005918), due to wear. This caused excessive "blow-by" of the refrigerant ga resulting in loss of cold production and an increase in power input.

REPAIR ACTION:

eplaced piston-rulon assembly, part number SM-C-5005853.

Disposition of removed part: CRYO LAB

Failure Found During: Acceptance Test ☐ Design Approval Test ☐ Reliability Test ☒ Field Use ☐ Other .....

Reported by	Reviewed by (Engineering)	Project Manager	Quality Assurance
Robert Martinez	Ram Narayan		3/16/88

FAILURE ANALYSIS REPORT

ANALYSIS

In order to determine the cause for the reduced performance, a thorough investigation anc analysis was performed.

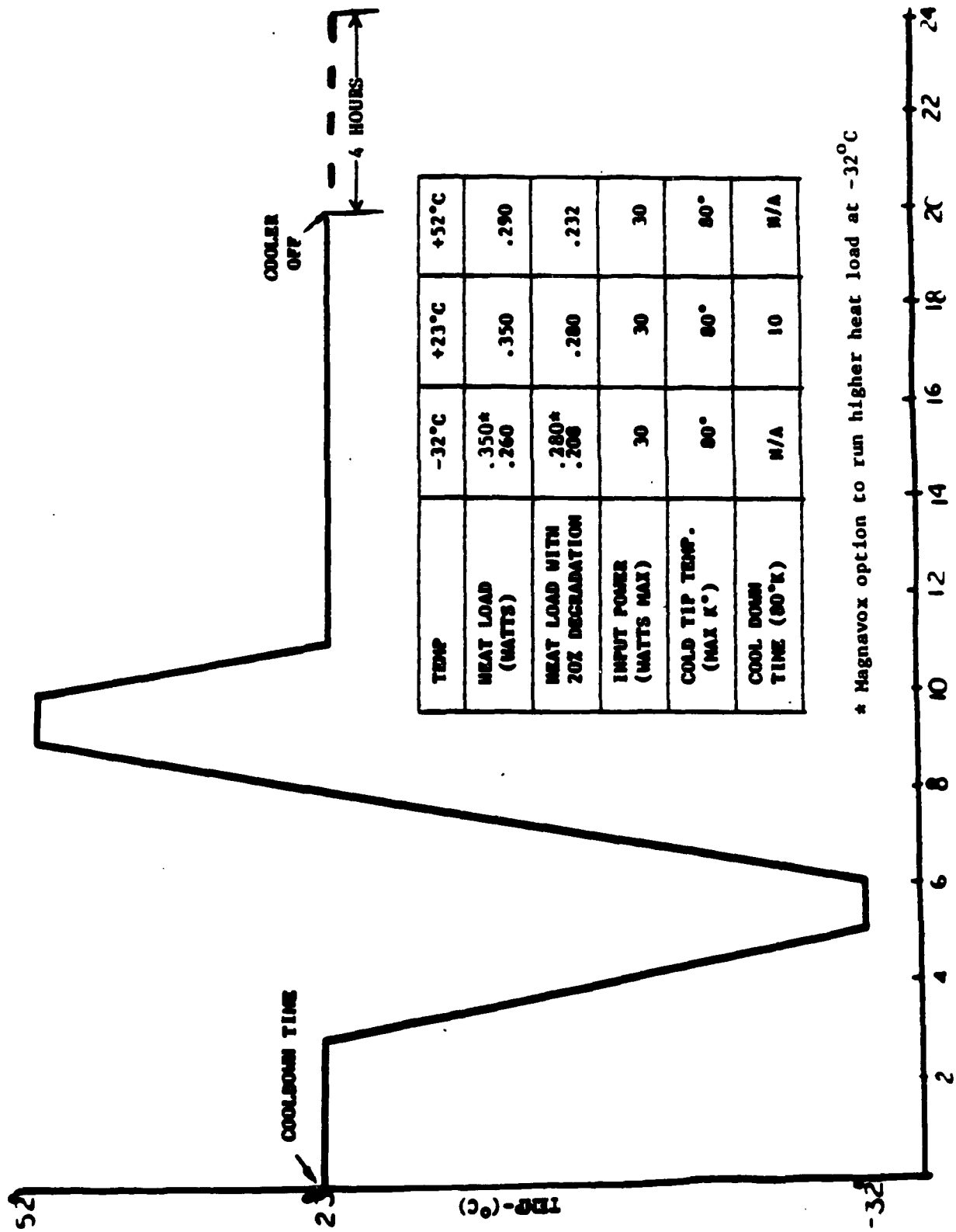
1. Upon removal from the life test station, the cooler was leak checked, the data wa: 0.9 x 10-9; well within specification limits. (Spec: 2.7 x 10-7).
2. The cooler was taken to a gas analysis lab to have the gas analyzed. The regrigerant ga: was not contaminated. (See report, Figure 5).
3. After the gas analysis in 2 above; the cooler was vacuum baked, purged, charged, and the: run through a full ATP. Cooler performance improved, but not significantly. (See data Figure 6).
4. The expander was then disassembled; and the regenerator was removed. The pieces wer examined and cleaned of a minimal amount of accumulated particulates. (See photos Figures 7 through 10). The unit was then re-assembled and retested with no improvemen in performance. (See data, Figure 11). The cooler still did not meet the performanc requirements.
5. At this point, the compressor was cut open and the electronics assembly was removed to b tested separately. The cooler was tested with AC drive to the motor. The cooler did no meet specification requirements. (See data, Figure 12). The electronics package wa found to be within specification limits.
6. The vibration absorber/piston-coil assembly was removed and inspected. No contaminatio worthy of note was found. The piston rulon O.D. and the inner yoke I.D. were checke dimensionally. The data revealed a clearance of .0023" to .0033". This is a substantia increase from the specification clearance limits of .0004" to .0009". Figure 13 present the post life test measurements and the specification limits.
7. Having found the anomaly, the piston was removed and a new piston was installed.
8. SN 11 was then re-assembled, purged, charged, and AC tested using all original component except for the new piston-rulon assembly. Cooler performance met the specificatic requirements. (See data, Figure 14).
9. After the AC test, the original electronics package was installed in SN 11. The unit we subjected to and passed a full acceptance test. (See data, Figure 15).
10. In conclusion, it was both impressive and gratifying to find the minimal amount o particulate matter in the cooler; and to be able to return the cooler to full performanc with only a replacement of the piston-rulon assembly, after nearly 6500 hours o operation. The findings were significant in that they appear to answer the question "what is a suggested refurbishment philosophy applicable to the Magnavox long-life linea cooler?"

CORRECTIVE ACTION

None required.

Analysis by	Engineering	Project Manager	Quality Assurance	Date
	Ram Naraya			3/16/83

Copies: S. Cacioppo, R. Day, W. Garbo, S. Isgro, D. Lehrfeld, R. Martins, F. Mollo, R. Naraya R. Prather, R. Rothstein (DCAS), E. Kyerson. Contracts/CNVEO: H. Dunmire, S. Pomeroy



TEMP	-32°C	+23°C	+52°C
HEAT LOAD (WATTS)	.350 .260	.350	.290
HEAT LOAD WITH 20% DEGRADATION	.280* .208	.280	.232
INPUT POWER (WATTS MAX)	30	30	30
COLD TIP TEMP. (MAX K°)	80°	80°	80°
COOL DOWN TIME (80°K)	N/A	10	N/A

* Magnavox option to run higher heat load at -32°C

FIGURE 1. Test Profile

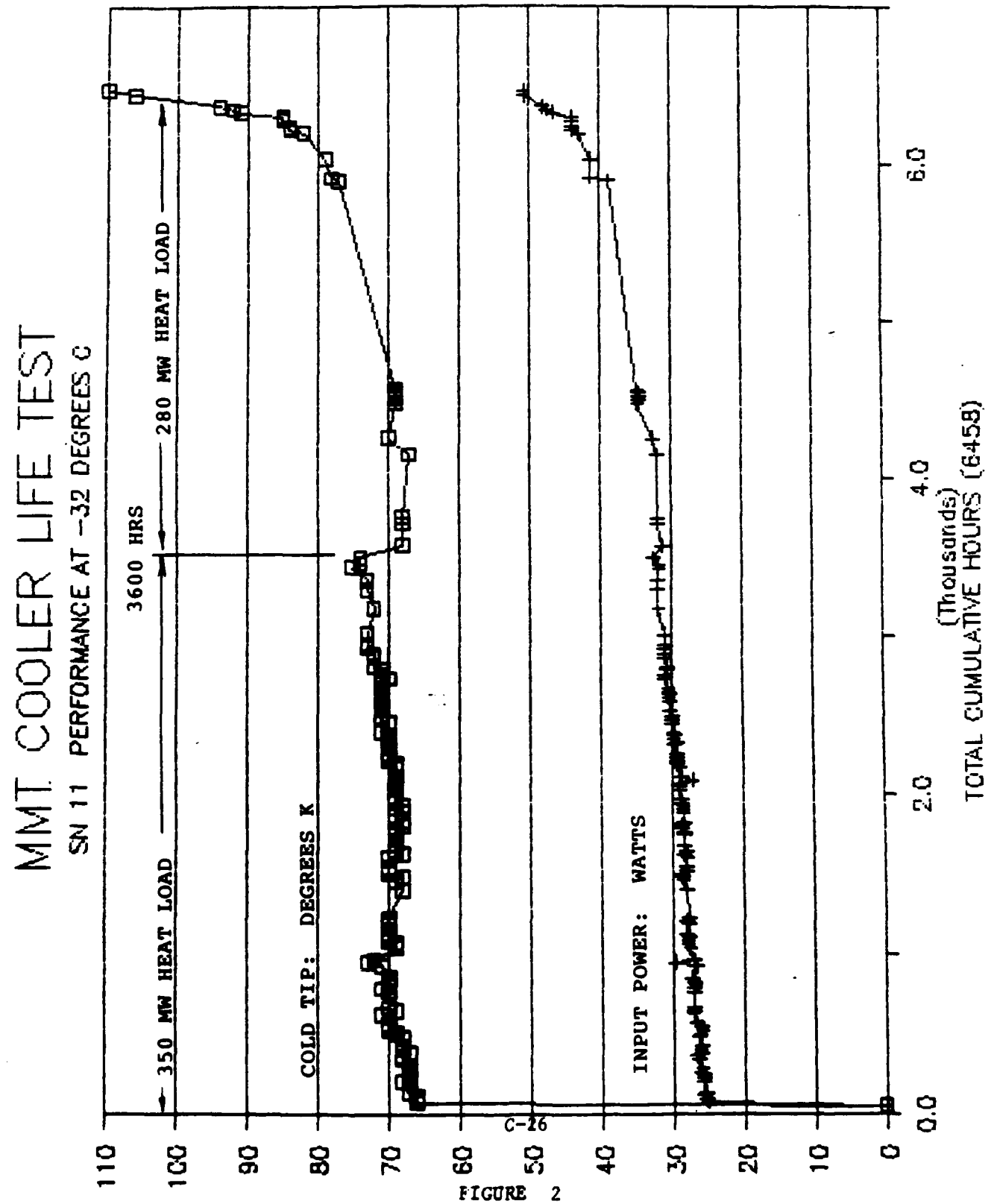

MMT COOLER LIFE TEST
SN 11 PERFORMANCE AT -32 DEGREES C
350 MW HEAT LOAD
3600 HRS
280 MW HEAT LOAD
COLD TIP: DEGREES K
INPUT POWER: WATTS
110
100
90
80
70
60
50
40
30
20
10
0
0.0
2.0
4.0
6.0
(Thousands)
TOTAL CUMULATIVE HOURS (6458)

FIGURE 2

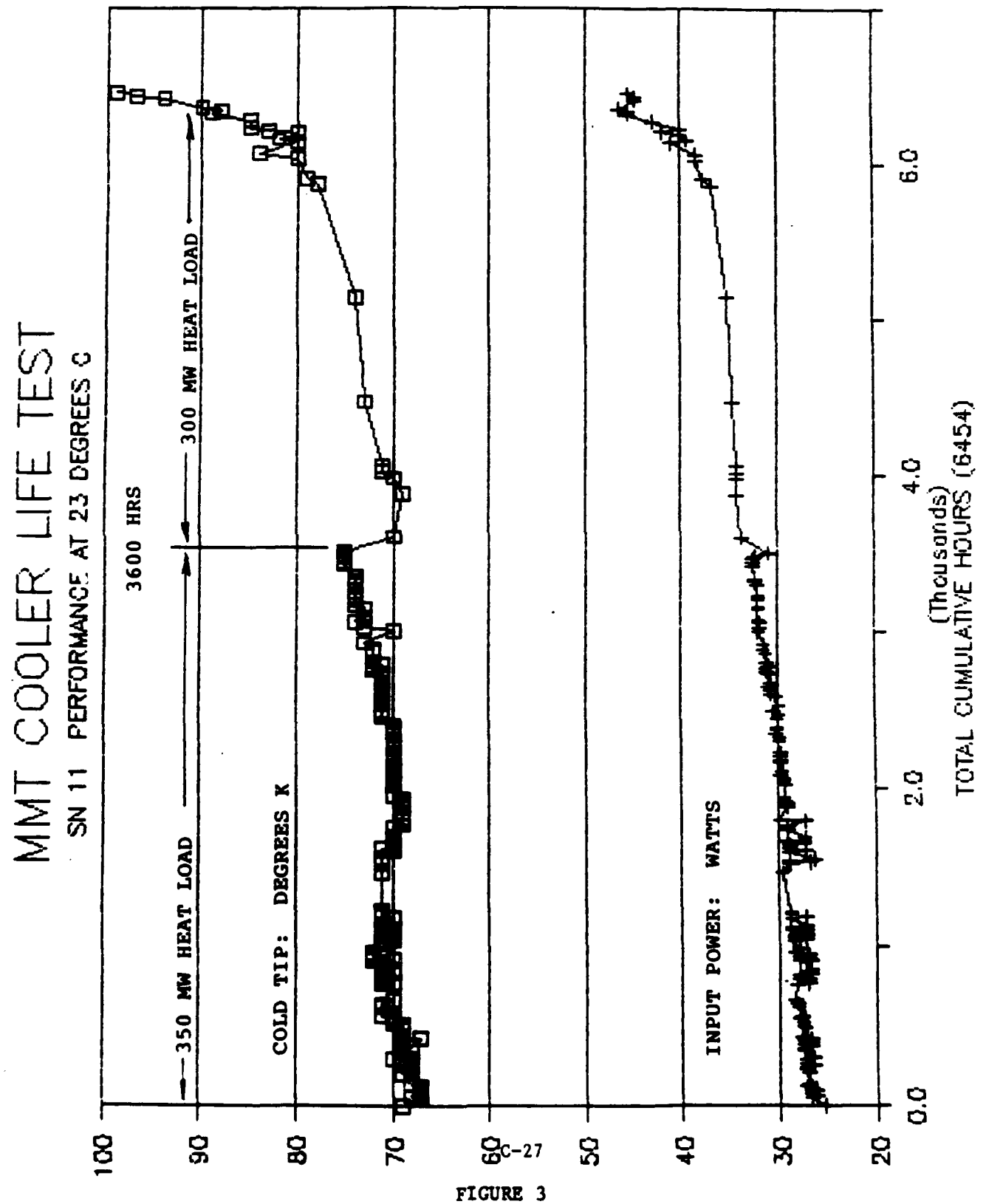

MMT COOLER LIFE TEST
SN 11 PERFORMANCE AT 23 DEGREES C
3600 HRS
300 MW HEAT LOAD
350 MW HEAT LOAD
COLD TIP: DEGREES K
INPUT POWER: WATTS
100
90
80
70
60
50
40
30
20
0.0
2.0
4.0
6.0
(Thousands)
TOTAL CUMULATIVE HOURS (6454)

FIGURE 3

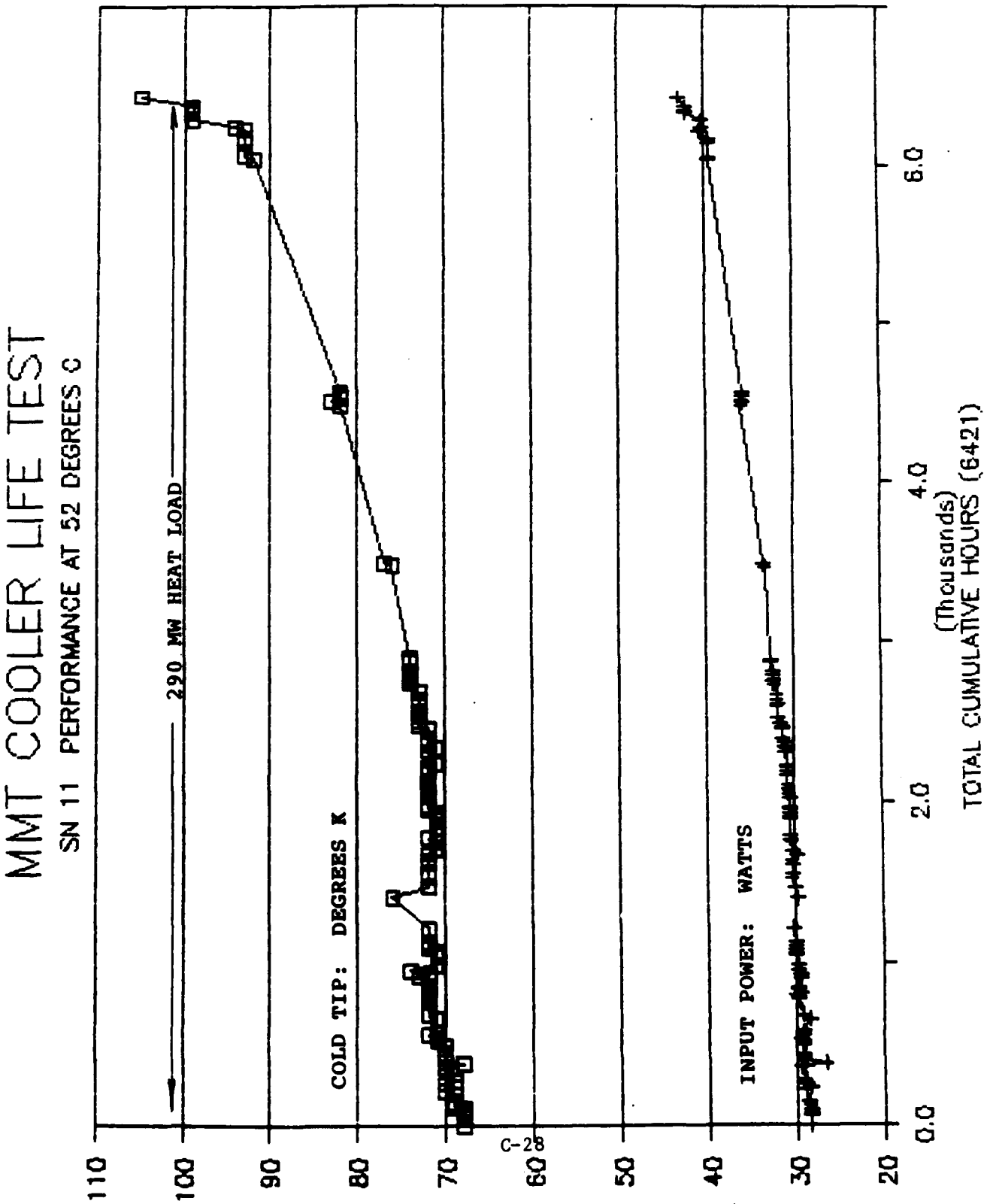

MMT COOLER LIFE TEST
SN 11 PERFORMANCE AT 52 DEGREES C
290 MW HEAT LOAD
COLD TIP: DEGREES K
INPUT POWER: WATTS
TOTAL CUMULATIVE HOURS (6421)
(Thousands)
0.0
2.0
4.0
6.0
110
100
90
80
70
60
50
40
30
20

FIGURE 4

Gollob Analytical Service

MOLININI/GOLLOB (A DIVISION OF) ENSECO (INCORPORATED)
47 INDUSTRIAL ROAD, BERKELEY HEIGHTS, NEW JERSEY 07922 • TEL. (201) 464-3331

TO: Mr. Hank Meehan
Magnavox
Electro Optical Systems
46 Industrial Avenue
Mahwah, NJ 07430

G.A.S. REPORT No. 65202

Date Requested: 10/20/87
Date Reported: 10/21/87
P.O. No. S5205

MATERIAL SUBMITTED: 1 (One) Cooler

INFORMATION REQUESTED: Mass Spectrometry & Electrolytic Hygrometer Analyses

NOTEBOOK REFERENCE: 1286, Pg. 46 & KD0, #1

RESULT OF INVESTIGATION

Sample Identity:	Concentration, % by Volume S/N 11 P/N SMD 5005842
Mass Spectrometry Analysis	
Constituents	
Nitrogen	0.0063
Oxygen	ND
Argon	ND
Carbon Dioxide	0.019
Hydrogen	0.066
Helium	Balance
Halogenated Compound*	0.0006
Electrolytic Hygrometer Analysis	
Water (ppm by Volume)	11

ND=None detected

*Possibly a "Freon" type compound.

This sample was scanned from mass 2 through mass 150 and no other constituents were detected. The detection threshold for most constituents is .0004%.

By _____
GOLLOB ANALYTICAL SERVICE

n 102187

Magnavox
ELECTRO-OPTICAL SYSTEMS

Contract No. _____ PERFORMANCE TEST

Project No. 24407-000 DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC, RX7045L SERIAL NO. 011

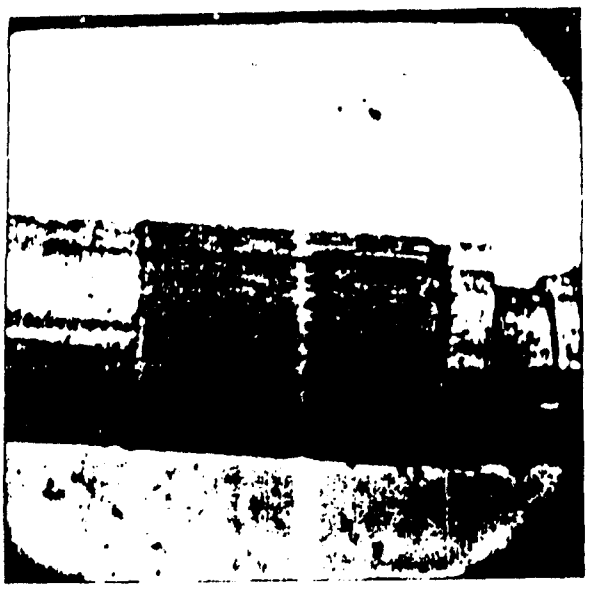
DRAWING NO. SM-D-5005842 Post Gas Analysis Test

TEST PLAN PARA	PARAMETER	MEASURED	UNITS	LIMITS MIN	LIMITS MAX
3.10	Calibration Check	Complete	-	Comply	
4.1.1	Inspection		-	Comply	
4.1.2	Weight		Lbs	-	2.5
4.1.3.1	Pressurization	330	PSIG	Info	Only
4.1.3.2	Leakage Rate	$0.9(10)^{-9}$	STP CC/SEC	-	2.7×10^{-7}
4.2.2	Test at 23°C				
4.2.2	Cooldown Time to 100°K	11.1	Minutes	-	7.5
4.2.2	Cooldown Time to 80°K	13.2	Minutes	-	10
4.2.2	Minimum Temp	56.2	°K	Info	80
4.2.2.1	Stabl. Temp. with 0.35 Watt Heat Load	124.70	°K (106.70)	(.280)	80
4.2.2.2	Temp. after 1/2 Hour Operation	126.90	°K (109.20)	(.280)	80
4.2.2.3	Cold Finger warm end temp	26.40	°C	Info	Only
4.2.2.4	Input V 17.5 VDC Current 2.50 ADC Power 43.75	43.75	Watts	-	30
4.2.2.5	Stabl. Temp with 0.35 Watt Heat Load		°K		80
4.2.2.5	Cold Finger Warm End Temp		°C	Info	Only
4.2.2.5	Input Volts 32 VDC Current ____ ADC Power ____		Watts	-	30
4.2.3	Test at -40°C				
4.2.3.1	Cooldown Time to 100°K	9.7	Minutes	-	7.5
4.2.3.1	Cooldown Time to 80°K	11.5	Minutes	-	10
4.2.3.2	Stabl. Temp with 0.2 Watt Heat Load	93.60	°K (93.20)	.208	80
4.2.3.2	Temp after 1/2 Hour	99.00	°K (93.40)	.208	80
4.2.3.3	Cold Finger Warm End Temp	-32.90	°C	Info	Only
4.2.3.4	Input V 17.5 VDC Current 2.80 ADC Power 49.00	49.00	Watts	-	30
4.2.3.5	Temp with 0.2 Watt Head Load		°K	-	80
4.2.3.5	Cold Finger Warm End Temp		°C	Info	Only
4.2.3.5	Input Volts 32 VDC Current ____ ADC Power ____		Watts	-	30
4.2.4	Test at 71°C				
4.2.4.1	Cooldown Time to 100°K	14.1	Minutes	-	7.5
4.2.4.1	Cooldown Time to 80°K	16.2	Minutes	-	10
4.2.4.1	Stabl. Temp. with 0.2 Watt Heat Load	104.10	°K (96.30)	.232	80
4.2.4.1	Temp after 1/2 hour	106.20	°K (98.80)	.232	80
4.2.4.2	Cold Finger Warm End Temp	79.60	°C	Info	Only
4.2.4.3	Input V 17.5 VDC Current 2.60 ADC Power 45.50	45.50	Watts	-	35
4.2.4.4	Stabl. Temp with 0.2 Watt Head Load		°K	-	80
4.2.4.4	Cold Finger Warm End Temp		°C	Info	Only
4.2.4.4	Input Volts 32 VDC Current ADC Power ____		Watts	-	35
4.2.5	Test at 23°C				
4.2.5.1	Cooldown Time to 100°K	10.5	Minutes	-	7.5
4.2.5.1	Cooldown Time to 80°K	13.1	Minutes	-	10
4.2.5.1	Minimum Temp	57.20	°K		80
4.2.5.2	Stabl. Temp with 0.35 Watt Heat Load	125.30	°K (104.6)	(.280)	80
4.2.5.3	Temp After 1/2 Hour With Heat Load	124.70	°K (108.2)	Info	80
4.2.5.4	Cold Finger Warm End Temp	25.8	°C	Info	Only
4.2.5.5	Input V 17.5 VDC Current 2.54 ADC Power 44.45	44.45	Watts	-	30
4.2.5.6	Stabl. Temp. with 0.35 Watt Heat Load		°K		80
4.2.5.6	Cold Finger Warm End Temp		°C	Info	Only
4.2.5.6	Input Volt 32 VDC Current ____ ADC Power ____		Watts	-	30
4.2.6	Leakage Rate	$0.8(10)^{-9}$	STP CC/SEC	-	2.7×10^{-7}

PERFORMED BY [signature] DATE 10/29/87

WITNESSED BY [signature] Q.A. MAGNAVOX

WITNESSED BY C-30 Q.A. CUSTOMER

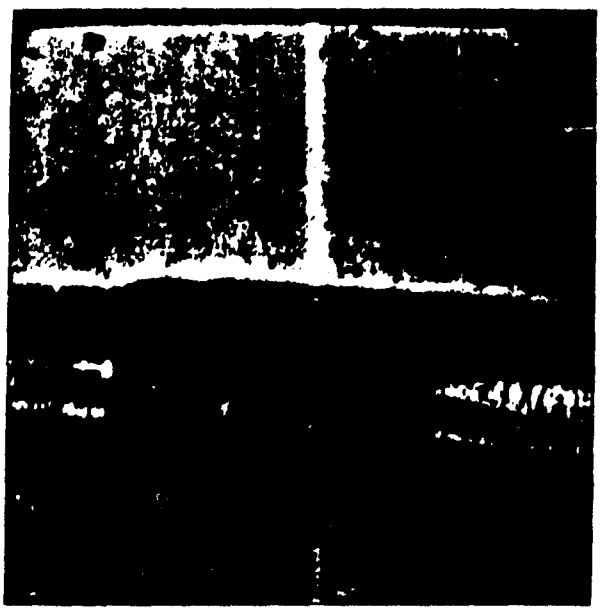


WEAR PRODUCTS ON SEAL & SURROUNDING AREA
S/N 011 10/30/87

FIGURE 7

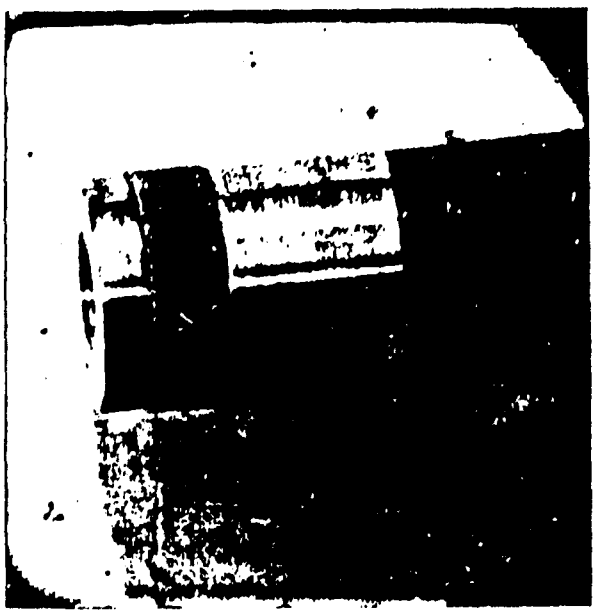
WEAR PRODUCTS ON SPRING & KEEPER
S/N 011 10/30/87

FIGURE 8



RUB MARKS ON SEAL
S/N 011 10/30/87

FIGURE 9



FRONT RELATIVELY CLEAN
S/N 011 10/30/87

FIGURE 10

Magnavox
ELECTRO-OPTICAL SYSTEMS

Contract No. _____ PERFORMANCE TEST

Project No. 24407-000 DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC, HX7045L SERIAL NO. 011

DRAWING NO. SMD-5005842 POST COLDFINGER INSPECTION TEST

TEST PLAN PARA	PARAMETER	MEASURED	UNITS	LIMITS MIN	LIMITS MAX
3.10	Calibration Check		-	Comply	
4.1.1	Inspection		-	Comply	
4.1.2	Weight		Lbs	-	2.5
4.1.3.1	Pressurization	330	PSIG	Info	Only
4.1.3.2	Leakage Rate	1.1(10)-9	STP CC/SEC	-	2.7x10-7
4.2.2	Test at 23°C				
4.2.2	Cooldown Time to 100°K	11.5	Minutes	-	7.5
4.2.2	Cooldown Time to 80°K	13.1	Minutes	-	10
4.2.2	Minimum Temp	56.80	°K	Info	80
4.2.2.1	Stabl. Temp. with 0.35 Watt Heat Load	114.60	°K (99.80)	.280	80
4.2.2.2	Temp. after 1/2 Hour Operation	114.60	°K (101.60)	.280	80
4.2.2.3	Cold Finger warm end temp	26.40	°C	Info	Only
4.2.2.4	Input V 17.5 VDC Current 2.60 ADC Power 45.50	45.50	Watts	-	30
4.2.2.5	Stabl. Temp with 0.35 Watt Heat Load		°K		80
4.2.2.5	Cold Finger Warm End Temp		°C	Info	Only
4.2.2.5	Input Volts 32 VDC Current ____ ADC Power ____		Watts	-	30
4.2.3	Test at -40°C				
4.2.3.1	Cooldown Time to 100°K	42.2	Minutes	-	7.5
4.2.3.1	Cooldown Time to 80°K	10.6	Minutes	-	10
4.2.3.2	Stabl. Temp with 0.2 Watt Heat Load	110.50	°K (89.80)	(.208)	80 (85.40) -200
4.2.3.2	Temp after 1/2 Hour	98.40	°K (91.70)	(.208)	80 (86.00) -200
4.2.3.3	Cold Finger Warm End Temp		°C	Info	Only
4.2.3.4	Input V 17.5 VDC Current 3.80 ADC Power 49.00	49.00	Watts	-	30
4.2.3.5	Temp with 0.2 Watt Head Load		°K	-	80
4.2.3.5	Cold Finger Warm End Temp		°C	Info	Only
4.2.3.5	Input Volts 32 VDC Current ____ ADC Power ____		Watts	-	30
4.2.4	Test at 71°C				
4.2.4.1	Cooldown Time to 100°K	13.8	Minutes	-	7.5
4.2.4.1	Cooldown Time to 80°K	15.9	Minutes	-	10
4.2.4.1	Stabl. Temp. with 0.2 Watt Heat Load	100.90	°K 94.30	(.232)	80 (89.60) -200
4.2.4.1	Temp after 1/2 hour	100.60	°K 96.80	(.232)	80 (90.10) -200
4.2.4.2	Cold Finger Warm End Temp	77.20	°C	Info	Only
4.2.4.3	Input V 17.5 VDC Current 2.60 ADC Power 45.50	45.50	Watts	-	35
4.2.4.4	Stabl. Temp with 0.2 Watt Head Load		°K	-	80
4.2.4.4	Cold Finger Warm End Temp		°C	Info	Only
4.2.4.4	Input Volts 32 VDC Current ADC Power ____		Watts	-	35
4.2.5	Test at 23°C				
4.2.5.1	Cooldown Time to 100°K	11.5	Minutes	-	7.5
4.2.5.1	Cooldown Time to 80°K	13.4	Minutes	-	10
4.2.5.1	Minimum Temp	57.10	°K		80
4.2.5.2	Stabl. Temp with 0.35 Watt Heat Load	114.60	°K (103.3)	(.280)	80
4.2.5.3	Temp After 1/2 Hour With Heat Load	115.10	°K (104.8)	Info	80
4.2.5.4	Cold Finger Warm End Temp		°C	Info	Only
4.2.5.5	Input V 17.50 VDC Current 2.60 ADC Power 45.50	45.50	Watts	-	30
4.2.5.6	Stabl. Temp. with 0.35 Watt Heat Load		°K		80
4.2.5.6	Cold Finger Warm End Temp		°C	Info	Only
4.2.5.6	Input Volt 32 VDC Current ____ ADC Power ____		Watts	-	30
4.2.6	Leakage Rate		STP CC/SEC	-	2.7X10-7

PERFORMED BY _____ DATE 11/3 - 11/4/87

WITNESSED BY _____ Q.A. MAGNAVOX

WITNESSED BY _____ Q.A. CUSTOMER

Magnavox
ELECTRO-OPTICAL SYSTEMS

Contract No. _____ PERFORMANCE TEST
Project No. 24407-000 DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC, RX7045L SERIAL NO. 011
DRAWING NO. _____ POST CUT OPEN TEST AC 54Hz

TEST PLAN PARA	PARAMETER	MEASURED	UNITS	LIMITS MIN	LIMITS MAX
3.10	Calibration Check	Complies	-	Comply	
4.1.1	Inspection		-	Comply	
4.1.2	Weight		Lbs	-	2.5
4.1.3.1	Pressurization	330	PSIG	Info	Only
4.1.3.2	Leakage Rate (O RING)	12/10-8	STP CC/SEC	-	2.7×10^{-7}
4.2.2	Test at 23°C				
4.2.2	Cooldown Time to 100°K	12.40	Minutes	-	7.5
4.2.2	Cooldown Time to 80°K	14.30	Minutes	-	10
4.2.2	Minimum Temp	86.20	°K (104.80)	Info	80
4.2.2.1	Stabl. Temp. with 0.35 Watt Heat Load	121.30	°K (106.80)	(.280)	80
4.2.2.2	Temp. after 1/2 Hour Operation	122.40	°K (108.20)	(.280)	80
4.2.2.3	Cold Finger warm end temp		°C 26.0	Info	Only
4.2.2.4	Input V 10.20 VDC Current 3.29 ADC Power _____	33.6	Ø+17.40 Watts	-	30
4.2.2.5	Stabl. Temp with 0.35 Watt Heat Load		°K		80
4.2.2.5	Cold Finger Warm End Temp		°C	Info	Only
4.2.2.5	Input Volts 32 VDC Current ____ ADC Power _____		Watts	-	30
4.2.3	Test at -40°C				
4.2.3.1	Cooldown Time to 100°K	11.30	Minutes	-	7.5
4.2.3.1	Cooldown Time to 80°K	12.40	Minutes	-	10
4.2.3.2	Stabl. Temp with 0.2 Watt Heat Load	115.20	°K (91.60)	(.20%)	80 (87.80) .2c
4.2.3.2	Temp after 1/2 Hour	116.30	°K (94.20)	(.20%)	80 (89.60) .2c
4.2.3.3	Cold Finger Warm End Temp	-33.0	°C	Info	Only
4.2.3.4	Input V 9.60 VDC Current 4.30 ADC Power _____	41.30	Ø+24.1 Watts	-	30
4.2.3.5	Temp with 0.2 Watt Head Load		°K	-	80
4.2.3.5	Cold Finger Warm End Temp		°C	Info	Only
4.2.3.5	Input Volts 32 VDC Current ____ ADC Power _____		Watts	-	30
4.2.4	Test at 71°C				
4.2.4.1	Cooldown Time to 100°K	14.60	Minutes	-	7.5
4.2.4.1	Cooldown Time to 80°K	17.10	Minutes	-	10
4.2.4.1	Stabl. Temp. with 0.2 Watt Heat Load	108.60	°K (96.80)	.232	80 (94.20) .2c
4.2.4.1	Temp after 1/2 hour	110.20	°K (98.20)	.232	80 (96.10) .2c
4.2.4.2	Cold Finger Warm End Temp		°C	Info	Only
4.2.4.3	Input V 10.60 VDC Current 3.52 ADC Power _____	37.37	Ø+24.2 Watts	-	35
4.2.4.4	Stabl. Temp with 0.2 Watt Head Load		°K	-	80
4.2.4.4	Cold Finger Warm End Temp		°C	Info	Only
4.2.4.4	Input Volts 32 VDC Current ADC Power _____		Watts	-	35
4.2.5	Test at 23°C				
4.2.5.1	Cooldown Time to 100°K	12.20	Minutes	-	7.5
4.2.5.1	Cooldown Time to 80°K	15.30	Minutes	-	10
4.2.5.1	Minimum Temp	86.80	°K		80
4.2.5.2	Stabl. Temp with 0.35 Watt Heat Load	122.60	°K (103.20)	.208	80
4.2.5.3	Temp After 1/2 Hour With Heat Load	124.10	°K (104.60)	Info	80
4.2.5.4	Cold Finger Warm End Temp		°C	Info	Only
4.2.5.5	Input V 10.20 VDC Current 3.32 ADC Power _____	33.90	Ø+17.1 Watts	-	30
4.2.5.6	Stabl. Temp. with 0.35 Watt Heat Load		°K		80
4.2.5.6	Cold Finger Warm End Temp		°C	Info	Only
4.2.5.6	Input Volt 32 VDC Current ____ ADC Power _____		Watts	-	30
4.2.6	Leakage Rate		STP CC/SEC	-	2.7×10^{-7}

PERFORMED BY Robert Hunter DATE 11-9-87
WITNESSED BY _____ Q.A. MAGNAVOX
WITNESSED BY C-33 Q.A. CUSTOMER

QUALITY ASSURANCE DEPARTMENT

DIMENSIONAL CHECKLIST

SHEET ____ OF ____

R.R. ____

DATE 11-6-87

VENDOR CRYO TEST, LIFE TEST P.O. NO. ____ PROJECT NO. 24407

PART DESCRIPTION MTT COOLER, SN 011 PART NO. SM-D-5005843 Rev. ___ INSPECTOR W. SURMA

DEFECT CLASSIFICATION													
I.D.S. CODE		DIMENSIONAL CHECK OF PISTON RULON AND											
DIMENSION ▶		INNER YOKE BORE											
TOLERANCE ▶													
SERIAL OR LOT NUMBERS ▼													
INNER		1ST	FROM	OPEN	END								
YOKE		.299	.699	1.99	1.79								
SM-D-5005843		.3777	.3778	.3778	.3778								
PISTON		RULON SECTION											
SM-C-5005853		4	3	2	1	1 = SLOT END							
C=34													
	0°	.3744	.3747	.3753	.3745								
	90°	.3751	.3751	.3757	.3754								
MAX CLEARANCE		.0023	.0031	.0025	.0033								
SPEC CLEARANCE	MIN:	←	.0004	—	→								
	MAX:	←	.0009		→								
B/P SECTION													

ORF 118A TPF 383

FAILURE REPORT 24407-006
PAGE 12

Magnavox
ELECTRO-OPTICAL SYSTEMS

Contract No. 24407-000 PERFORMANCE TEST AC TEST 54 HZ
Project No. _____ DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC, RX7045L SERIAL NO. 011
DRAWING NO. SM-D-5005842 TEST AFTER PISTON REPLACEMENT

TEST PLAN PARA	PARAMETER	MEASURED	UNITS	LIMITS MIN	LIMITS MAX
3.10	Calibration Check	Complies	-	Comply	
4.1.1	Inspection		-	Comply	
4.1.2	Weight		Lbs	-	2.5
4.1.3.1	Pressurization	330	PSIG	Info	Only
4.1.3.2	Leakage Rate (O Ring)	$1.4(10)^{-7}$	STP CC/SEC	-	2.7×10^{-7}
4.2.2	Test at 23°C				
4.2.2	Cooldown Time to 100°K	4.60	Minutes	-	7.5
4.2.2	Cooldown Time to 80°K	5.50	Minutes	-	10
4.2.2	Minimum Temp	40.9	°K	Info	80
4.2.2.1	Stabl. Temp. with 0.35 Watt Heat Load	67.40	°K		80
4.2.2.2	Temp. after 1/2 Hour Operation	67.80	°K	-	80
4.2.2.3	Cold Finger warm end temp	30.0	°C	Info	Only
4.2.2.4	Input V 10.20 VAC Current 1.73 AAC Power ____	17.64	Watts	Ø-3.2 -	30
4.2.2.5	Stabl. Temp with 0.35 Watt Heat Load	—	°K		80
4.2.2.5	Cold Finger Warm End Temp	—	°C	Info	Only
4.2.2.5	Input Volts 32 VDC Current ____ ADC Power ____	—	Watts	-	30
4.2.3	Test at -40°C				
4.2.3.1	Cooldown Time to 100°K	4.40	Minutes	-	7.5
4.2.3.1	Cooldown Time to 80°K	5.30	Minutes	-	10
4.2.3.2	Stabl. Temp with 0.2 Watt Heat Load	51.5	°K	-	80
4.2.3.2	Temp after 1/2 Hour	50.5	°K	-	80
4.2.3.3	Cold Finger Warm End Temp	-33.0	°C	Info	Only
4.2.3.4	Input V 9.61 VAC Current 1.85 AAC Power ____	17.80	Watts	Ø+2.4 -	30
4.2.3.5	Temp with 0.2 Watt Head Load	—	°K	-	80
4.2.3.5	Cold Finger Warm End Temp	—	°C	Info	Only
4.2.3.5	Input Volts 32 VDC Current ____ ADC Power ____	—	Watts	-	30
4.2.4	Test at 71°C				
4.2.4.1	Cooldown Time to 100°K	5.6	Minutes	-	7.5
4.2.4.1	Cooldown Time to 80°K	6.5	Minutes	-	10
4.2.4.1	Stabl. Temp. with 0.2 Watt Heat Load	66.8	°K	-	80
4.2.4.1	Temp after 1/2 hour	68.8	°K	-	80
4.2.4.2	Cold Finger Warm End Temp	80.0	°C	Info	Only
4.2.4.3	Input V 10.40 VAC Current 2.06 AAC Power ____	21.40	Watts	Ø-17.7 -	35
4.2.4.4	Stabl. Temp with 0.2 Watt Head Load	—	°K	-	80
4.2.4.4	Cold Finger Warm End Temp	—	°C	Info	Only
4.2.4.4	Input Volts 32 VDC Current ADC Power ____	—	Watts	-	35
4.2.5	Test at 23°C				
4.2.5.1	Cooldown Time to 100°K	4.70	Minutes	-	7.5
4.2.5.1	Cooldown Time to 80°K	5.40	Minutes	-	10
4.2.5.1	Minimum Temp	39.40	°K		80
4.2.5.2	Stabl. Temp with 0.35 Watt Heat Load	64.90	°K	-	80
4.2.5.3	Temp After 1/2 Hour With Heat Load	65.20	°K	Info	80
4.2.5.4	Cold Finger Warm End Temp	30.0	°C	Info	Only
4.2.5.5	Input V 10.20 VAC Current 1.71 AAC Power ____	17.44	Watts	Ø-3.1 -	30
4.2.5.6	Stabl. Temp. with 0.35 Watt Heat Load	—	°K		80
4.2.5.6	Cold Finger Warm End Temp	—	°C	Info	Only
4.2.5.6	Input Volt 32 VDC Current ____ ADC Power ____	—	Watts	-	30
4.2.6	Leakage Rate		STP CC/SEC	-	2.7×10^{-7}

PERFORMED BY Robert Hartman DATE 12/1/87
WITNESSED BY _____ Q.A. MAGNAVOX
WITNESSED BY _____ Q.A. CUSTOMER

Magnavox
ELECTRO-OPTICAL SYSTEMS

Contract No. _____ PERFORMANCE TEST

Project No. 24407-000 DATA SHEET

COOLER, 1/4 WATT LINEAR RESONANT CRYOGENIC, MX7045L SERIAL NO. 011

DRAWING NO. _____ HYBRID INSTALLED. D.C. POWER

TEST PLAN PARA	PARAMETER	MEASURED	UNITS	LIMITS MIN	LIMITS MAX
3.10	Calibration Check	Comply	-	Comply	
4.1.1	Inspection		-	Comply	
4.1.2	Weight		Lbs	-	2.5
4.1.3.1	Pressurization	330	PSIG	Info	Only
4.1.3.2	Leakage Rate		STP CC/SEC	-	2.7×10^{-7}
4.2.2	Test at 23°C				
4.2.2	Cooldown Time to 100°K	5.20	Minutes	-	7.5
4.2.2	Cooldown Time to 80°K	6.10	Minutes	-	10
4.2.2	Minimum Temp	38.80	°K	Info	80
4.2.2.1	Stabl. Temp. with 0.35 Watt Heat Load	64.70	°K		80
4.2.2.2	Temp. after 1/2 Hour Operation	65.00	°K	-	80
4.2.2.3	Cold Finger warm end temp	26.0	°C	Info	Only
4.2.2.4	Input V 17.0 VDC Current 1.35 ADC Power	22.95	Watts	-	30
4.2.2.5	Stabl. Temp with 0.35 Watt Heat Load	66.20	°K		80
4.2.2.5	Cold Finger Warm End Temp	26.0	°C	Info	Only
4.2.2.5	Input Volts 32 VDC Current .80 ADC Power	25.6	Watts	-	30
4.2.3	Test at -40°C				
4.2.3.1	Cooldown Time to 100°K	4.80	Minutes	-	7.5
4.2.3.1	Cooldown Time to 80°K	5.00	Minutes	-	10
4.2.3.2	Stabl. Temp with 0.2 Watt Heat Load	50.30	°K	-	80
4.2.3.2	Temp after 1/2 Hour	50.50	°K	-	80
4.2.3.3	Cold Finger Warm End Temp	-37.0	°C	Info	Only
4.2.3.4	Input V 17.0 VDC Current 1.23 ADC Power	20.91	Watts	-	30
4.2.3.5	Temp with 0.2 Watt Head Load	55.20	°K	-	80
4.2.3.5	Cold Finger Warm End Temp	-37.0	°C	Info	Only
4.2.3.5	Input Volts 32 VDC Current .72 ADC Power	23.04	Watts	-	30
4.2.4	Test at 71°C				
4.2.4.1	Cooldown Time to 100°K	3.60	Minutes	-	7.5
4.2.4.1	Cooldown Time to 80°K	4.50	Minutes	-	10
4.2.4.1	Stabl. Temp. with 0.2 Watt Heat Load	69.90	°K	-	80
4.2.4.1	Temp after 1/2 hour	66.60	°K	-	80
4.2.4.2	Cold Finger Warm End Temp	76.00	°C	Info	Only
4.2.4.3	Input V 17.0 VDC Current 1.49 ADC Power	25.33	Watts	-	35
4.2.4.4	Stabl. Temp with 0.2 Watt Head Load	68.70	°K	-	80
4.2.4.4	Cold Finger Warm End Temp	77.00	°C	Info	Only
4.2.4.4	Input Volts 32 VDC Current ADC .89 Power	28.48	Watts	-	35
4.2.5	Test at 23°C				
4.2.5.1	Cooldown Time to 100°K	4.60	Minutes	-	7.5
4.2.5.1	Cooldown Time to 80°K	5.20	Minutes	-	10
4.2.5.1	Minimum Temp	38.30	°K		80
4.2.5.2	Stabl. Temp with 0.35 Watt Heat Load	64.30	°K	-	80
4.2.5.3	Temp After 1/2 Hour With Heat Load	64.60	°K	Info	80
4.2.5.4	Cold Finger Warm End Temp	26.0	°C	Info	Only
4.2.5.5	Input V 17.0 VDC Current 1.32 ADC Power	22.44	Watts	-	30
4.2.5.6	Stabl. Temp. with 0.35 Watt Heat Load	66.10	°K		80
4.2.5.6	Cold Finger Warm End Temp	25.0	°C	Info	Only
4.2.5.6	Input Volt 32 VDC Current .79 ADC Power	25.28	Watts	-	30
4.2.6	Leakage Rate		STP CC/SEC	-	2.7×10^{-7}

PERFORMED BY Robert Martinez C-36 DATE 12/3 - 12/4/87.

WITNESSED BY _____ Q.A. MAGNAVOX